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A Pull All Together!

INTEREST in the question of a national electricity canvass continues to grow.

We have faith to believe that it will not linger long in the discussion stage. Action—prompt action—action in hundreds of supply areas, is what is needed to save the industry from failing in its duty to the nation and to prove that authorised undertakers are really interested in the business in which they are engaged.

It is our aim that the words we are now writing shall hammer against the brain of every man whose voice or influence plays a part in dictating the policy of electrical supply activity in any district that matters. There ought to be no room for any laggards or obstructors. Reader! Are you one? If not, you must sit down quickly and prepare plans for getting on with the boosting effort necessary to bring your public into the electrical household. That is, if you have not already set your town ablaze!

The matter is not one for officials alone. With them the initiative may sometimes lie; they can suggest and may ultimately have to direct and execute; but often they are powerless, however well-intentioned, unless those under whom they serve can be brought to see that something should and must be done.

What director of a company is competent to direct, who is content to let the business take its leisurely course, developing here a little, there a little, without any purposeful design for reaching record loads and earning profits for shareholders?

Or what municipal committee-man, be he barrister or barman, is worthy to hold that honourable seat unless he is prepared to follow the splendid example set by a few of his kind in convincing his council that nothing pays better than a policy of enlightened electrical development entrusted to the care of a live engineer or manager who knows his job and is eager to perform it?

Some municipalities and *some* companies are working wonders, and the reputation of the industry is safe so far as they are concerned.

But there are others! Too-much-trouble, wait-a-little-longer, you-have-waked-me-too-soon—that is the sort of atmosphere surrounding them. Some may think that the expense of stirring up their community is not justifiable when economy is the general cry. But we have already dealt with that mistaken view. We can do a great deal to hamper the old country by cutting off essential expenditure.

There is work that makes more work and helps the nation in its hour of need. Electricity supply committees and municipal councils and boards of directors who defer necessary development until they have seen the economic crisis pass, may easily be delaying our recovery.

We hope that as one outcome of our present discussion there will be some new thinking in electrical circles.

Is the time ripe for the consolidation of electricity supply personnel—company and municipal alike—in one organisation? Does the same necessity exist for

the municipal flag as in the earlier days of the I.M.E.A.? Is it beyond attainment for municipal engineers and committee-men and company engineers and directors, should join forces?

How much stronger we should be with forces united and minds working together in devising and carrying into effect a policy for the electrification of Britain everywhere according to a five-year plan!

Putting on the Brake!

WHEN is economy not economy? Everybody who has followed the course of electrical progress at all closely knows that a showroom is an absolutely necessary part of the commercial equipment of an electricity undertaking. To cease expenditure which will produce trade, increase employment, add to revenue and profit, would be wrong policy at any time. To-day it can only be described as utter folly—" penny wise and pound foolish "! Why Swindon, with a profitable electricity business, should decide to postpone its showroom scheme for two years when it knows the chances of doing a much more profitable business with it almost immediately, is a question to put to its Economy Committee. The Council's decision is a mistake and electricity departments in other towns should avoid so bad an example.

Follow Brighton!

LET them follow the lead of Brighton, already referred to here. Both the present and former borough electrical engineers there have found the showroom a priceless boon. We remember Mr. Christie fairly bubbling over with his characteristic good humour as he told of the ever-flowing stream of interested consumers who had to pass through the showroom on the way to pay their quarterly accounts. A capital means of inducing the consumer to buy more apparatus and add more points! And what Mr. Christie found in his day Mr. Clinch is certainly finding now, or the congestion of the North Road showroom would not have made the provision of a temporary additional one necessary. The I.M.E.A. consistently advocates an advanced showroom policy. Why must Swindon lag behind?

Next Summer

IT has been decided that the next Convention of the Incorporated Municipal Electrical Association shall be somewhat curtailed, with the intention that the expenses incurred by municipalities in sending delegates may be reduced. That some change might be made in the interests of economy was hinted at last week. Such conventions have helped engineers and committee-men to secure the success of their undertakings. To sacrifice such an aid altogether would certainly be a mistake. A shortened meeting—from June 15th to 18th (Wednesday to Saturday)—at Cardiff, with two papers, is what we have to look forward to. It is intended to cut down the social features as much as possible, but things may change materially for the better by then if we all put our shoulders to the wheel. And wherever two or three Incorporated Municipals gather together, how can the social element be missing?

The Canvassing Contractor

THERE was a time when electrical contractors behaved very much like electricity supply authorities. That is, they sat pat and said to the public: "If you want any electrical work done, come and fetch us." Their advertising consisted of tiny tablets (" A. Jones and Co. Electrical work a speciality ") in obscure corners of local newspapers, and their showrooms and workshops were much the same thing. Nowadays, like the supply authorities, contractors realise that the aloof " professional " air doesn't pay and they are really going out for business. This applies not only to the large firms but also to the smaller concerns, and in this issue Mr. W. G. Graham gives a series of very practical and useful tips to this class of contractor. His remarks regarding canvassing are particularly apposite at a time when we are advocating a nation-wide house-to-house visitation to bring the British public on to the mains. Although we have been aiming primarily at the electricity supply authorities, we feel sure that their efforts will have to be followed up very closely by the contractors to clinch the business. The two parties must co-operate, for in this way they will be able to cover more ground without overlapping. To-day they too often treat one another with suspicion—or even antagonism.

Electrical Dumping

THERE need be no beating about the bush with regard to the national policy on dumping. The Runciman Bill which will receive the Royal Assent this evening will arm the Board of Trade with powers for the next six months to issue Orders imposing duties up to 100 per cent. of their value on goods in Class 3, which includes electrical machinery and apparatus, if there is abnormal importation. The statistics for October appear in this issue. The public in this country buys far more foreign electrical apparatus to-day than it did seven years ago, as Mr. D. N. Dunlop showed in our issue of June 19th, 1931. Temporary powers for exercise under expert advice in case of emergency are absolutely necessary. Concerning the future—well, everybody knows that domestic and other installation products must inevitably bulk overwhelmingly in the electrical business of the next few years. And, knowing that, we ought all to do everything in our power, by our own production methods and by national policy, to keep this business in the hands of British workmen.

" Buy British! "

HAS any message been delivered with greater urgency and emphasis in these columns for years past? Let the contractor and the wholesaler, the retailer and the big stores manager too, search their hearts and look round upon their stores! What have they laid in for their Christmas trade? We fear that far too much of that trade in the past has not been in goods of British workmanship. The public may be expected to ask for British goods. It is not too late to prepare to meet their wants.

Waste Not!

THE old question of waste of material was raised last week at the Industrial Welfare Society. The speaker was Mr. E. S. Byng (managing director of Standard Telephones & Cables). In short, he said that the subject had been neglected here, that it was a vital matter and everybody ought to deal with it, that all waste should be reduced to the minimum, and that those at the top should set an example to those at the bottom. Some readers will remember the old cry, " Watch the Scrap-heap! " It originated in our American contemporaries when trolley tramway systems were making a network of lines across the States like the grid lines are doing here now. Every system had its scrap-heap of old wheels, axles, overhead parts, and so forth—junk in general, but among the useless much good was lost. Time was money! Since then what a waste there has been everywhere. Now we are suffering, and we must be economical and never thoughtlessly or designedly wasteful.

Electricity and the Doctors

WE have given publicity on numerous occasions in the past to the testimony of medical men regarding the use of electricity as a curative agent, especially by the discreet application of ultra-violet rays. E.D.A. made a good start by getting Dr. W. Beaumont to deliver the first of its winter lectures (reported by us on October 23rd), and we are glad to note that the E.A.W. has arranged with Dr. Elizabeth Sloan Chesser to give two lectures on the 23rd and 30th of this month. The subject is of interest to anyone concerned in the maintenance of health—that is, everyone.

The Ferranti Farm

Coal now used only for threshing; ultimate commercial success is fully expected

BY CAROLINE HASLETT, C.B.E.

TO convert an ordinary farmstead into one run electrically is no easy matter, and Mrs. G. Z. de Ferranti is to be congratulated on the success which she has achieved in a short time in modernising by electrical means the farm which she purchased just over a year ago, at Upper Basildon, near Pangbourne

The electrifying process was commenced last April, and the farm has been worked electrically for about one month.

The property comprises 200 acres, divided into 70 acres of arable land and 130 acres of pasture. The buildings are arranged centrally in one block around two yards, which has made electrification much easier.

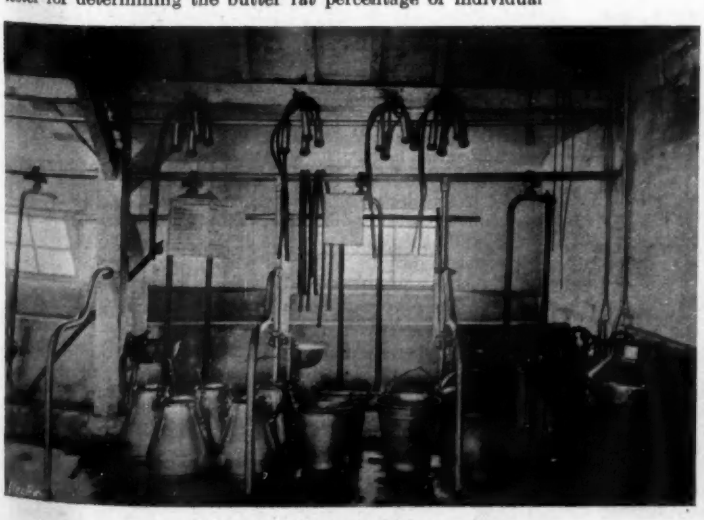
Situated 400 ft. above sea-level in beautiful Berkshire country, the farm is within a short distance of one of the loveliest stretches of the Thames and within easy reach of the market town of Reading. It is being run entirely on mechanical lines; two tractors only are now employed. One horse is kept, more for sentimental reasons than for actual use.

Miss and Mrs. de Ferranti

The farm is within two and a half miles of the nearest electricity undertaking, but there were considerable difficulties in getting a supply. A guarantee of £200 per year was required and a contract price was eventually agreed upon of £10 per kW of maximum demand and ¾d. per kWh for all purposes, including both house and farm. A special off-peak tariff of 1d. per kWh has since been arranged for the new steam-raising plant which is seen in one of the illustrations.

Milking and Sheep Shearing

The chief attraction at the moment is the newly built cowshed, 80 ft. by 32 ft., which is extremely well lighted by means of eight lamps of 150 W each in "Holophane" reflectors. At one end of the cowshed there are four rooms. No. 1 contains the electric steam raiser for sterilising, and an electrically driven milking machine vacuum pump; No. 2, the cooling plant; No. 3, a receiving pan for tipping milk; and No. 4, the sterilising chest, electric separator, butter churn, and a Gerber tester for determining the butter fat percentage of individual cows in order that the quality can be maintained at a certain standard.



Electric milking machines

The farmhouse and buildings

The cost of milking forty cows by electricity is 1½d. a day, and only two men are employed, instead of the usual four. The Reyrolle electric steam raiser is believed to be the first equipment of its kind to be installed on a farm for this purpose.

Mrs. Ferranti is hoping to rear her own cattle; at the moment she has a herd of forty Shorthorns, and has, in addition, as she explained it, a school and a nursery for the calves. There is also an electrically operated clipping machine by means of which the cows' hair is trimmed in order to facilitate hygienic milking.

The dining room

Sheep shearing is done electrically; the cost of electricity for shearing one hundred sheep in two days is 2½d.; this has resulted in the saving of one man's time. There is a flock of eighty-nine Border-Leicester breeding ewes, crossed with the Suffolk for fat lamb production.

The Poultry Farm

Turning to the poultry farm, here we find a flock of Rhode Island Reds, and although at the moment there are only a hundred of these birds, it is hoped in time to increase the number to a thousand. A thermostatically controlled Peter Sim incubator for 266 eggs is in operation; in this the temperature is maintained within one degree F.

When Mrs. Ferranti bought it four years ago there was not a suitable electric incubator on the market in England, but she hopes, when she extends her poultry farm, to be able to replace it with one of the excellent British machines that are now available. There are a number of chicken houses about the grounds, one of which contains three electric foster-mothers. All the chicken houses are fitted with "Vita-glass" windows.

All the farm buildings are electrically lighted, and a farm workshop which is in process of arrangement will be fully equipped with electric drills, emery wheels, saws, and other tools to cope with all necessary farm repairs. It is hoped in time to install crushing and other

(*Concluded at foot of next page.*)

Heating a Scottish Hospital

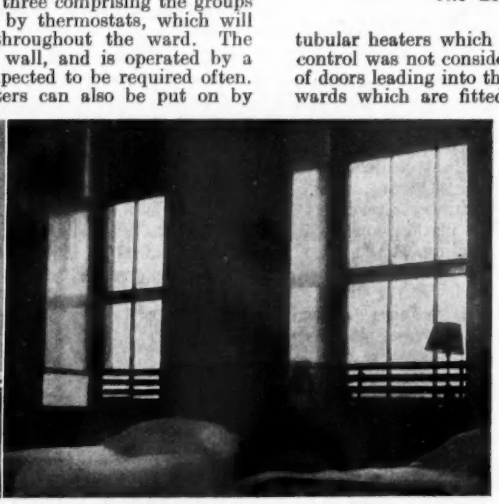
LIKE many similar institutions, the Lockhart Hospital, Lanark, was founded and supported for many years by a local family. In 1930 its modernisation was necessary, and a guarantee company was formed to administer it, and to procure funds for the purpose.

Coal fires had been the only method of heating previously, and some form of central heating was required. Both hot water and electric tubular systems were considered and it was found that the electric tubular system would entail least disturbance to the building, and that it would not be expensive in operation. Its cleanliness and ability to maintain an even temperature without increasing the work of the staff were also appreciated. Messrs. Allan Arthur and Ure obtained the contract for the installation.

There are two main wards in the hospital, for male and female patients respectively, each having eight beds. These have both been fitted with 140 ft. of tubular heaters, arranged in four circuits. Of these circuits three comprising the groups on the outer walls are controlled by thermostats, which will maintain an even temperature throughout the ward. The fourth circuit is on the partition wall, and is operated by a switch at the door, as it is not expected to be required often. The automatically controlled heaters can also be put on by switches at the door. The heating has been worked out on a basis of one watt per cu. ft., and the total loading is 8.3 kW.

The Lockhart Hospital, Lanark

The operating theatre



Heaters on window ledges of a main ward

The long passages joining the main wards are fitted with tubular heaters which are left on continuously. Thermostatic control was not considered suitable owing to the large number of doors leading into this passage. There are also small private wards which are fitted with 3-kW heaters.

Continuous heating is not required in the operating theatre. In order to warm it quickly in emergency, however, the loading is 1½ watts per cu. ft. About 64 ft. of the tubular heaters, representing 3.84 kW, are placed round the skirting and a short length is set under the skylight to reduce the heat-loss through it to a minimum.

The opportunity was taken while the heating was being installed to fit an electric steriliser, and a "shadowless" lamp over the operating table, shown in one of the illustrations to the left.

The total loading of the whole installation is 30 kW. Electricity is supplied from the Clyde Valley Electrical Power Co.'s mains at the local rate of ½d. per kWh and a fixed charge. The nearest generating stations of the company are the two hydro-electric stations on the Clyde, where that river skirts the town in a deep defile, some 300 ft. below the hospital.

G. S. WILTON, B.Sc., GRAD.I.E.E.

The Ferranti Farm *(continued from previous page)*

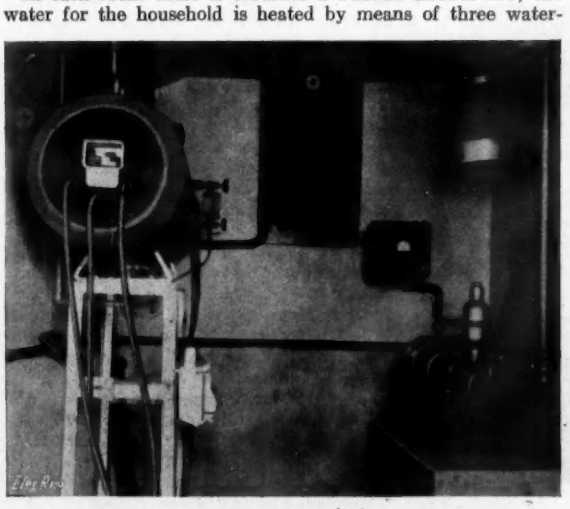
electrically driven machinery for use everywhere on the farm.

Mr. G. King-Forster, N.D.A., who commenced his electric farming with the late Dr. Ferranti at Baslow Hall and who is acting as bailiff for Mrs. Ferranti, feels that there is every reason why the farm should eventually be commercially successful, and accurate figures are being kept of the cost of the various operations performed electrically.

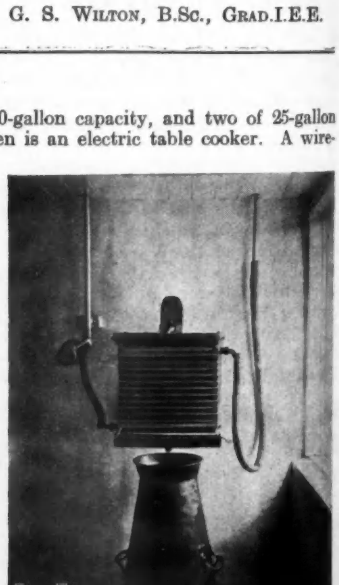
Electricity in the House

The house, which is of the sixteenth century, has been entirely re-designed and modernised by Mrs. Ferranti, "Vitaglass" having been used for all the new windows; and many old windows have been opened out to give as much light and air as possible.

In each room there is installed a built-in electric fire; the water for the household is heated by means of three water-heating units, one of 60-gallon capacity, and two of 25-gallon capacity. In the kitchen is an electric table cooker. A wireless receiving set, electric heating, and other appliances are installed in the servants' sitting-room.



Steam raiser and electric pumps for milking



Milk cooler

The luxuries of a complete electrical service are evident in all parts of the house; in the bathroom the rays from an electric heater fitted to the ceiling ensure the comfort and warmth of the bather. The wardrobes and cupboards in the bedrooms are equipped with automatic lighting devices, and in addition to the electric fire, built artistically in the wall, there is the cosiness of an electric blanket for the bed. It is therefore apparent that the house can truly be called "all-electric."

Mrs. Ferranti feels that although she has got first-class domestic help in the ordinary way, it would make the position far easier if these people had been trained to do their work electrically.

This brief description of an electric farming enterprise will serve to show the enormous strides which determination and energy can make in a short space of time, and Mrs. Ferranti has the satisfaction of knowing that her electric farm has also brought electricity within the reach of numerous other houses and cottages in the district, and has thus formed a nucleus for local electrical development.

The Contractor's Job. By W. Gore Graham

How to secure work and make a profit

SINCE the arrival of rural electrification schemes a vast army of contractors, employing from one to a dozen hands, has risen up. These contractors are mostly ex-wiremen who have set up on their own, and while they have a very fair knowledge of the actual wireman's job, they frequently lack the business ability that is so essential if a connection is to be built up and kept.

The bread-and-butter line of their business is simple house wiring, which naturally follows in abundance when supply is commenced in a new district. While a certain amount of small power work also comes their way, it cannot be denied that the majority of them would not remain in business long if it were not for the plain and straightforward finished house wiring.

It is not my object to advise these contractors how to do the actual work (they are mostly perfectly competent themselves), but it will be my aim to show how such business may be gained, and to explain one or two essential points necessary to make sure that the contractor stands at least an even chance when competing against his rivals.

Canvassing and its Preliminaries

Before the actual canvassing of a new district is undertaken, it is absolutely necessary for the canvasser to acquaint himself with the supply authority's rules, apart from the I.E.E. and Home Office Regulations.

Let me give an example: An electric cooker was installed in a certain locality in an exactly similar manner to that employed in another district, *i.e.*, a 7/.029 cable was run direct from an ironclad distribution board to a plug socket, a flexible connection then being made to the cooker. This method was approved by one supply concern, but in the other case an enraged householder rang up to say that he wished to use his new cooker and the company had refused to connect up unless an independent i.c. switch-fuse was fitted immediately adjacent to the cooker. The extra work involved more than took all the profit from the job, as the firm was working to a contract price and had not allowed for the switch-fuse or the extra journeys each way to fit it.

It is wise to make quite sure whether any service charges are made by the undertaking and also to ascertain the prices per kWh under different scales. In other words, the representative should make a point of being in the enviable position of being able to answer any queries which a potential customer may ask. If he has to go away and find out the price of this or that or whatever it may be, he may consider himself lucky if a rival has not come along and clinched the contract in the meantime.

The Value of Circulars

Now as to the actual procedure to be adopted when canvassing. I have found that the best way to open up new ground is to let a boy occupy his Saturday afternoon by delivering circulars to every house, shop, stores, etc.; this should certainly be done on Saturday, as the householder usually has more time to read such literature over the week-end. The circular must be short and pithy, giving just the contractor's name, address, telephone number, and any public bodies for whom he is a regular contractor.

Having delivered these circulars, it is necessary to follow them up, and it should be borne in mind that it is absolutely useless to carry out the initial canvass in the daytime as the householder is almost always out (usually at work himself). The job must be done at night after working hours to meet with any success.

If one books an order it may be followed up in the daytime, because the lady of the house will be amenable to suggestions regarding the purchase of extras which she would think twice about mentioning if her husband were present!

We will assume that the representative, after having made himself thoroughly acquainted with the locality, distance from shop, etc., in order that he may have his keenest prices worked out to a penny, calls on a Mr. A, who lives in a detached house of from twelve to fourteen rooms, and has not yet received any quotation or specification.

The Price-per-Point Fallacy

Mr. A will probably say, "Well, I've got about fourteen rooms, so I suppose I want about the same number of points. How much do you charge per point?" It is absolutely essential that the representative should have a well developed sales sense as well as a fair technical knowledge, and experience has shown that such a question may be hedged when it comes to answering it.

I should reply something like this: "Well, we usually charge about 18s. 6d. per point for a standard lead-covered job, but I'm afraid that that is not really as informative as it may appear. You see, we are experts in giving advice as well as doing the work, and you will find that our all-in price for the complete installation comes out at well under that figure, so I would prefer to have a look round your house and then quote you for a really economic yet efficient installation."

It is high time that the old "price-per-point" bogy was well and truly laid by the heels—it is unreliable and old-fashioned, as I will show later.

Additional Plug Points

The representative should then go round the house, taking great care to point out to Mr. A that a switch-plug by his favourite chair is invaluable for a reading lamp, and at the same time emphasising the importance to Mrs. A of a plug point on the stairs for a vacuum cleaner.

Strong mention should be made of power points now that electricity is becoming so popular for heating and cooking, and a good salesman can usually succeed in getting an extra plug point included for the radio. Two-way switching on the stairs or corridors, one- or two-way pear switches over the beds—all these little extras can be supplied if the canvasser is alive and knows his job. "What about the bells; are they working?" or "Has Mrs. A not had any at all before?"

I should say that half of the houses which I have known to be wired in the last two years have needed extensive bell repairs or an entirely new circuit. The owners of these houses would never have thought of it but for the fact that it was brought before them by a live representative.

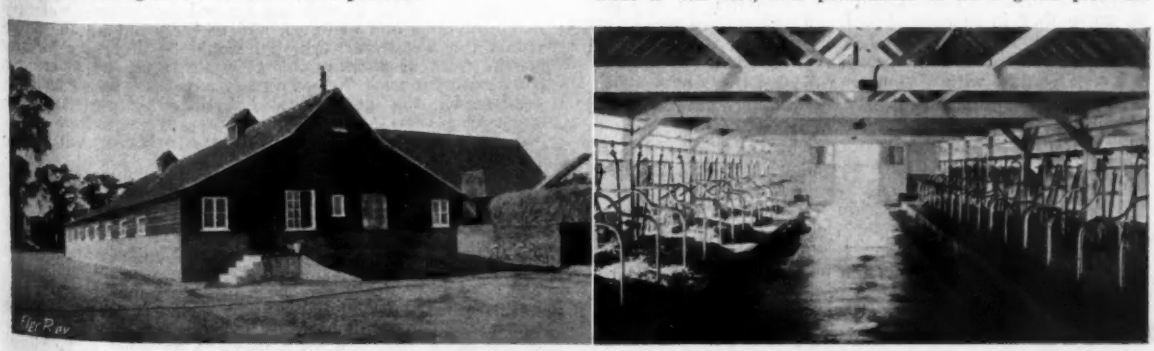
It should be remembered that power and cooker points are the most profitable side of this work, as it surely is a poor salesman who sells a man a power point and lets another firm sell him the fire!

It is possible that the owner knows what he wants and won't be advised, and then it is only possible to quote your keenest price, as it at once becomes apparent that some other rival has already quoted.

Points and Fractions

Referring once again to the time-honoured "price-per point" system of quoting may I show the fallacy of it here. The specification for Mr. A's installation covers the following variety of points:—(*a*) standard light points, 1; (*b*) standard light plug points, 5-6; (*c*) power points, 1½; (*d*) cooker points, 2; (*e*) two-way switching on stairs, ½; (*f*) hanging two-way pear switching over beds, ½; and (*g*) two lights off one switch, 1½.

There are thus possibly seven types of point or parts of points and one is expected to give a price per point. Actually, when estimating very approximately to give the client an idea of what it will cost, it is permissible to fix a given price for



The electrically equipped cowhouse at the Ferranti farm *(See preceding pages.)*

item (*a*) and then price the installation on the fractions of a point shown. These fractions are not absolutely accurate, but they may be taken as a guide.

Wiring Systems

Before turning to estimating proper I want to say a word about the system that Mr. A will finally employ. I suppose that 95 per cent. of the finished houses are wired in lead-covered cable (in the provinces anyway)—conduit work, screwed, slip or lug grip is usually out of it on account of ugliness on brick walls, unless they are chased out, which is at once a dirty and expensive job by the time the making good is done.

The cheapest method of wiring a modern bungalow is undoubtedly by slip conduit—I have known bungalows wired throughout, with all-British material, for 11s. 6d. per point at a good profit. But Mr. A won't have any chasing out, and it will probably turn out to be one of the 95 per cent. lead-covered jobs.

Personally, I prefer a good all-insulated job in c.t.s., particularly now "Bakelite" switches are so popular. All the wiring is concealed when under the floors and stud walls; where it comes on the surface it should be covered in that very neat wood beading which can readily be finished off to match the surrounds. Labour should be cheaper for this system, which I should like to see more popular for finished-house work.

Estimates must be Based on Knowledge

Many contractors are forced out of business by one of two causes: (*a*) estimating on the high side through lack of knowledge of the finer points or bad purchasing; or (*b*) estimating on the low side and making losses.

If the purchasing side of the business is efficient, the only hard part of estimating for such a job as Mr. A's is the labour. The normal knowledgeable contractor can readily fix a price which will put him on the safe side, but in these days of competition it is not good enough to be on the safe side, for Mr. A will probably get two or three more prices, and however charming the representative may be, Mr. A will consider the shillings when making his choice among the rival contractors.

The contractor should know how long he and his men take to do different types of house wiring, and it is essential for his well-being that his representative (or he himself if he is canvassing) should note the following points which will materially affect his labour estimate:—

Average area of rooms.
Number of points per "way" (distribution board).
Direction of floor boards.
Whether floor boards are tongued and grooved or plain.
Whether floor boards are oak or plain white wood.
Whether there is a trap in the roof.
What furniture, linoleum, carpets, etc., are to be moved.
Whether linoleum, carpets, rugs, etc., are loose or attached.
Number of stud or brick walls where vertical wires will go.

Now of the above points, the first two will help him to fix cable lengths, while all the others are essential for an accurate estimate of labour; with these points he should be able to arrive at his cost to a shilling.

I do not imply that a really skilled and experienced man should always work on these lines, but it can be likened to the differential calculus where the experienced man will differentiate a complicated equation straight away, while the ordinary man will arrive at the same result from *first principles*, and it is the latter method that I would emphasise as so important where contractors find that jobs don't pay, or that one firm always beats them by a matter of a few shillings.

Low Prices Yielding Fair Returns

I myself have taken on work at a price that has made rival contractors laugh, accuse me of price-cutting and prophesy a loss, but they would have been surprised to know that a very fair profit was made, entirely owing to careful observation of the different sub-headings set out above. All this goes to prove that in modern skilled and rationalised work, the "price-per-point" bogy must be fallacious and that the system must be used with extreme care if it is used at all.

I once worked with a man who did his share of business, seemingly, evolving general schemes of procedure. He had drawn up a most comprehensive and elaborate catalogue in which he priced points in all systems and all sizes of houses, but none of the above points was allowed for—we disagreed over that catalogue.

A skilled man knows to within five minutes how long his men will take over a given job in which the above items are favourable or otherwise. Now, having arrived at the labour value (we have already given the purchasing department full marks) it only remains to price up all the material, add the two together, plus whatever percentage of labour cost is necessary to cover overheads, and we arrive at the bare cost price to the contractor.

It is vitally important to remember that if the job is, say, six or seven miles from the base, the van charges, or whatever other means of travel for men and material, should be added.

The Question of Profit

When this has been done we come to consider the addition of profit, a really tricky point.

It is primarily important to find out which other firms (if any) are likely to tender, and it should be borne in mind that there are usually one or two firms in every locality which are known as price-cutters. They may be so, but, on the other hand, they may have skilful representatives and a shrewd estimating department, in which case they will appear to cut prices. In practice, however, they probably put in equally good material and still make a fair profit.

That word "fair" is to be noted. It is better to take on a job with a little profit than not to take it at all, for one reason only—overheads are a constantly recurring cost and must be met.

If the correct percentage addition to the labour cost is made, overheads will look after themselves, provided the men are working. *Therefore, in times of competition like these, remember that small profits on many jobs mean a better balance-sheet than the same gross profit made over the same period with only half the work done.* This is *very important*, and is a point which is rarely considered by small provincial contractors.

Supplying the Equipment

Now on Mr. A's job, if the canvasser is a live man the order for the fittings, fires, etc., will follow that for the installation. It is better, therefore, that he should clinch his order with a very small profit than to lose it altogether.

Mr. A will probably order £12 worth of fittings (if he has more than one fire or so it will exceed this figure), and it should be remembered that this means about £4 clear profit alone, and if we put the cost of the installation at £10 and add 10 per cent. profit, making a total quotation of £11, the total amount will be £11 plus £12=£23, on which there is a profit of £5, more than 20 per cent. Now this is a very excellent all-round profit if the turnover can be kept up, and it plainly shows that 2½ per cent. only need be added to the installation cost to obtain a good overall profit.

A full specification should be prepared and despatched at once. It must be followed up the next evening, when it can be explained in detail; also it should be emphasised that the installation is all-British—I hope. Foreign electrical gear (with the barely possible exception of roses) is really not worth while, and sometimes roses are the cause of poor insulation resistance tests.

Co-ordinating Jobs

It may be taken for granted that several other installations similar to Mr. A's have been followed up concurrently, and we will assume that at least one has been successful. The representative must endeavour to arrange that both jobs shall start on the same date, thus halving travelling or van costs for each job. If one order has been booked and you know that a slight price reduction can secure another, then remember that van costs on that job can be cut out without affecting the profit on the two.

Finally, having completed the contract, never forget that an occasional call in the first month or so does all the good in the world, and that the key words for a successful contractor are "service and courtesy," which will retain the connection which live estimating and good workmanship originated.

Progress of Pykara Scheme

The Government of Madras, at the suggestion of the chief hydro-electric engineer, proposes to form a commercial engineering section to push forward and popularise the electrification of mills and factories, and to carry out all the propaganda and educative work that would be necessary to carry on the work of distribution. It is also proposed to create a conversion fund for the purpose of advancing loans to industrialists for the electrification of their factories. If these proposals are carried out, the distribution of power from Pykara will be greatly facilitated and industry in Madras will receive a considerable impetus.

From the programme of work undertaken by the Electrical Department for the present year, it is certain that the project will be completed before the end of 1932. The Government Telegraph Department will complete the erection of the telephone lines before the end of the year. Similarly work on the h.p. line and the l.p. systems will be commenced immediately. The erection of the power house plant and machinery will be well advanced by the end of this year, the Pykara-Coimbatore transmission line will be ready for test, and the construction of the other lines and sub-stations is expected to be almost completed.

Portable Electric Tools. By H. Richards

Their design, uses, and selection

A STUDY of the catalogues issued by manufacturers of portable electric tools will reveal that there are machines for drilling, reaming, grinding, buffing, filing, screw-driving, nut-setting, riveting, stone polishing, and many other purposes. In every case the electric motor is designed as an integral part of the whole unit, the rest of the machine being built to suit the special purpose for which the tool is required.

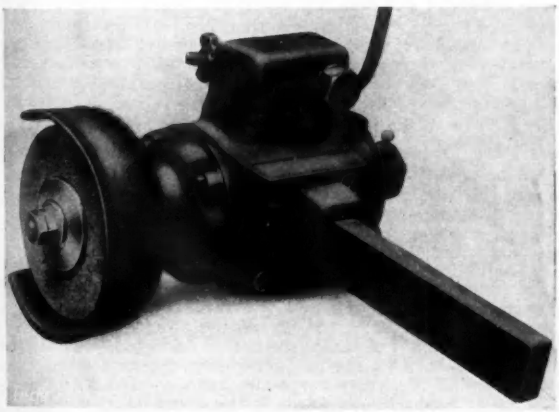
The electric tool in most general use is the drilling machine, in which an electric motor drives the drilling spindle through a system of reduction gearing. The gearing reduces the armature speed (usually about 6,000 r.p.m.) to a speed suitable for drilling. An electric drill is generally rated by the makers on the maximum size of hole which it will drill in mild steel; thus, when inquiring for prices of such tools, it is only necessary to specify the largest size of hole to be drilled, and state the voltage and nature of the electric circuit available. If the machine is to be used for drilling wood only it can usually be safely calculated that the drilling capacity will be nearly double that for drilling mild steel. A machine listed, for example, by the makers for drilling ⅜ in. holes in steel should be quite capable of drilling ¾ in. diameter in wood, provided that a correct type of wood auger drilling bit is used.

"Universal" Motors

Most drilling machines are now built with motors of the so-called "universal" pattern, or commutator series-wound motors, which function equally well on both d.c. and single-phase a.c. Care should be taken before connecting up any machine to see that the voltage of the circuit does not exceed by more than 10 per cent. the voltage figure stamped on the machine itself.

Small hand drills are usually fitted with a self-centring chuck to carry the twist drills, but on machines of ½ in. capacity and over a morse taper socket is advisable, as the twist drill is then provided with a positive drive, and any tendency for the twist drill to slip is obviated.

Some makers market machines with two-speed gears, and at least one maker lists a machine with three speeds. Such



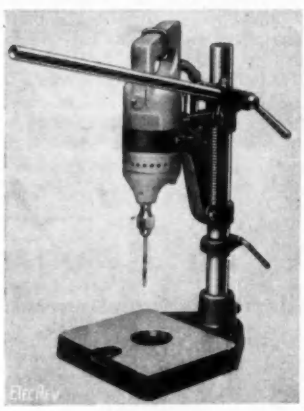
Tool-post electric grinder

machines are invaluable where drilling in various materials has to be done, as for instance in steel, brass, and wood. In this direction the universal motor type of machine has a distinct advantage, as the speed of the motor is controlled to a certain extent by the load imposed. This results in a high speed when using a small twist drill, and a correspondingly lower speed when a heavier load is imposed by a larger diameter of drill.

Three-phase Machines

Where a three-phase power circuit is available, a machine fitted with a squirrel-cage induction motor has the advantages of cheaper maintenance and of freedom from trouble. Electric drills from ¼ in. capacity up to 2 in. capacity can be obtained with this type of motor. Where the use of a large quantity of machines is under consideration, it is advisable to explore the merits of "high-frequency" electric tools, i.e., with motors designed for frequencies of from 150 to 180 cycles. Unless from ten to fifteen machines are in constant use, however, the extra expense of the special convertor is hardly warranted. The maintenance costs of such tools are extremely low, as the motors are of the induction type, and give practically no trouble. Furthermore, the weight factor of this type of machine is much lower than that of a similar capacity machine built for ordinary d.c. or 3-phase a.c. circuits.

Portable electric grinders are similar in construction to drilling machines, but no reduction gears are used, and the grinding wheel is mounted directly on to the motor spindle. This is necessary, as grinding wheels only perform efficient work if a certain known surface speed is maintained. This surface speed, for general all-round work on portable grinders, is about 5,000 ft. per min., or expressed in revolutions per minute would be 4,700, 3,200, and 2,400, respectively, for wheels with diameters of 4 in., 6 in., and 8 in.



Hand drilling machine mounted on bench stand

Owing to the danger of fracture of the grinding wheels if the spindle speed is increased, a motor which gives a constant speed at all loads is essential, and for this reason universal motors are unsuitable, except in the case of small hand grinders, where a reduction gear is incorporated between the motor spindle and the grinding-wheel spindle, or on small grinders for internal grinding work. On such machines the wheels do not exceed 3 in. in diameter.

Good designs of electric grinding machines should embody the following points leading to satisfactory operation:—

(a) The motor body should be of such size that a maximum overlap is given to the grinding wheel.

(b) The motor should be totally enclosed to prevent ingress of grinding dust.

(c) The spindle bearings should be well protected against dust, and of ample size to prevent rapid wear.

(d) The motor must be so designed that the speed remains constant whether on or off load.

Suitability of Machine to Duty

It is important to ensure that the grinding wheel fitted to the machine is of the correct grit, grade, and bonding to suit the work in hand, as a wheel designed to grind cast steel is totally unsuitable for grinding a soft metal such as aluminium. When changing the machine over to some other job, it is essential again to consider whether the grinding wheel already fitted is going to serve the purpose. Portable grinding machines for such jobs as fettling castings, dressing welded joints, and facing up steel construction work are designed with the grinding wheel carried at the end of an extension spindle, the extension usually being about 12 in. long. This gives the wheel sufficient clearance, so that the motor body does not impede the operator.

In another type of grinder for similar work the wheel is mounted on a ball-bearing spindle at one end of the flexible shaft. The operator is relieved of carrying the total weight of the driving motor, and for some classes of work this type of machine is to be preferred to the self-contained unit. The latter, however, can be provided with a spring-balance device, which takes the weight whilst the operator moves the machine over the surface to be ground. To some extent the spring balance does away with the portability and handiness of the machine, whereas with the flexible shaft type of grinder, the driving motor can be mounted on a light trolley which renders it easily mobile.

Portable hand grinder

For grinding between centres on a lathe, or for odd grinding jobs on a shaping or milling machine, the tool-post grinder is used. The motor of this type has a shank protruding from the body, so that it can be clamped in the tool holder of the lathe or other machine tool on which the work is to be performed. In order to obtain the best results from these machines, it is important to see that the grinder is firmly bolted to the lathe, and that all working slides on the latter are properly adjusted to avoid slackness, otherwise the job will tend to show "chatter" marks.

For a precision-ground finish, a grinder on which the grinding spindle is belt-driven should be employed. The belt drive has a certain amount of elasticity, and absorbs any vibration which may be transmitted from the motor spindle.

Although they cannot strictly be termed portable, small bench grinders are usually regarded as coming into the category of portable electric tools. The bench grinder has a simple form of electric motor with spindles extended on both sides for mounting coarse and fine wheels. The sizes of grinding wheels range from 6 in. diameter for tool grinding to 16 in. diameter for dressing small castings. Extra attachments such as means for sharpening twist drills, for wet grinding or surface grinding, can usually be fitted.

Miscellaneous Applications

Under the heading of miscellaneous tools comes a range of forge-fire blowers, screwdriving machines, tyre pumps, valve seaters, &c. The electric screwdriver is similar in design to a hand drill, but is fitted with a slipping clutch, so that the screwdriver bit ceases to rotate as soon as the screw (or nut) is driven fully home. The valve seater is also an adaptation of the electric drill, but it gives an oscillating movement to the tool instead of a rotary movement, which means that an engine valve is rapidly reground in position. It is a valuable tool where a large fleet of cars or lorries has to be maintained in order.

The development of the portable electric tool, as we know it to-day, is the result of a widespread demand for light, handy tools for all classes of work; as it was found easier "to take Mahomet to the mountain," so, in many cases, it is better to "take the tool to the job."

Notes on Resonance. By B. J. Shillito

Distinct similarity between electrical and mechanical characteristics

IN a wireless set resonance is utilised in an accurately tuned circuit to assist in obtaining sensitivity and selectivity. The a.c. resistance (impedance) of a tuned circuit possessing capacity C in farads, induction L in henries, and resistance R in ohms, is $\sqrt{R^2+(2\pi nL-1/2\pi nC)^2}$, where n is the frequency in cycles per second. Ohm's law for a.c. circuits then becomes:—C (amps.)=E (volts)/$\sqrt{R^2+(2\pi nL-1/2\pi nC)^2}$.

Regarding the expressions in brackets, the first one, $2\pi nL$, determines the inductive reactance, and the second $1/2\pi nC$ the capacity reactance. With any given value of L and C at a certain frequency n, the inductive and capacity reactances will be equal to one another, and the expression within the brackets will disappear, which means that the self-inductance (magnetic inertia) of the circuit is just balanced by its electrical capacity, and the circuit will behave as if it had neither inductance nor capacity. Ohm's law in the case of such a circuit then becomes the same as for a direct-current circuit, namely, C=E÷R.

The frequency n at which this occurs is called the resonant frequency, and the impedance of the whole circuit at this frequency is simply its resistance in ohms. The frequency at which resonance occurs is easily obtainable from Ohm's law for an a.c. circuit.

Since the capacity reactance is equal to the inductive reactance at resonance, that is, $2\pi nL=1/2\pi nC$, then the resonance frequency is given by $n=1/2\pi\sqrt{L.C}$ in cycles per second, where L and C have the same values as indicated above.

Power Circuits

If resonance occurs in a high-voltage power circuit it will result in practically a short circuit, as the only factor limiting the current will be the ohmic resistance of the circuit. This effect in the case of a long a.c. transmission line leads sometimes to interesting results, such as the voltage at the far end of the line being higher than that at the power-station end, but this does not necessarily mean an increase in the power delivered at the far end; the effect is due to the phase

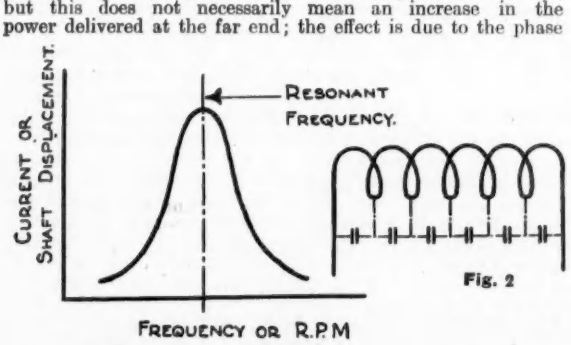


Fig. 1

Fig. 2

relations of the quantities involved. The transmission line in America from Big Creek to Los Angeles, which is 240 miles long, has a voltage at no load at the delivery end of the line 15,000 V higher than that at the generator end of the line, the normal transmission voltage being 150,000 V.

At the old Deptford (East) single-phase, 10,000-V, 85-cycle station in London, it was found that if an increase of the periodicity from 85 to nearly 85¾ cycles took place the fifteenth harmonic of the voltage wave would have the required frequency to cause resonance, and the rise of ¾ cycle represented less than 1 per cent. rise in the speed of the engine driving the alternator.

If the voltage wave were a pure sine wave with no harmonics, such resonance could not, of course, occur, but the fact that it can occur at the frequencies of the simple harmonics, as well as at the fundamental frequency should always be borne in mind. If the current in an a.c. circuit be measured, or calculated, at a number of different frequencies a curve can be drawn similar to the accompanying typical resonance curve (fig. 1).

Radio Tuning Coil

As the current at resonance depends solely on the voltage divided by the resistance, an efficient resonant circuit in a wireless set must have a low resistance. A tuning coil has inductance proportional to the square of the number of turns and also the self-capacity, as represented by fig. 2.

When the number of turns in the coil is, say, doubled, the inductance will be four times as great and at the same time the number of small condensers in series will be doubled, which will halve the overall capacity.

Now the resonant frequency as shown above is $1/2\pi\sqrt{LC}$, and, therefore, doubling the number of turns makes $\sqrt{LC}$ become $\sqrt{4L\times\frac{1}{2}C}$, which means that the resonant frequency n is reduced by a factor of 1.4, or, in general terms, adding turns to the tuning coil gradually diminishes relatively its natural frequency. To cover a given range of frequencies it is therefore an advantage to use as large a coil as possible (and a small tuning condenser) so long as its ohmic resistance is not excessive.

Mechanical Analogy

When a revolving shaft begins to whip, the amplitude of its displacement will be the maximum when a speed is reached corresponding to the natural period of vibration of the shaft, and this is called the resonant (whipping) speed. The shaft, like the electrical circuit, may also be thrown into quite serious vibration (resonance) at the frequencies of the simple harmonics. In the case of a vertical shaft about 10 ft. long driven at 1,200 r.p.m. by a directly-coupled variable-speed d.c. motor, the fundamental resonant speed was found to be about 1,600 r.p.m., but quite an appreciable whip was obtained at 800 r.p.m., too great to permit of continuous running at that speed. To avoid it the shunt speed-controller resistance was so arranged that the speed of 800 r.p.m. occurred between two of the "stops" on the controller, and therefore it was made impossible for the operator to run the machine at that dangerous resonant speed. The electrical curve applies equally to the mechanical example, the ordinates being the amplitude of displacement of the shaft at different speeds, and the abscissa r.p.m. instead of electrical frequency. One formula for the whipping speed of a vertical shaft is $n=Kd/L^2$, where L is the length of the shaft in feet; d its diameter in inches; and K a constant depending on how the shaft is supported. If it is directly coupled to a vertical motor at one end and to the machine to be driven at the other end, and the motor and machine bearings are oil-film lubricated and not therefore rigid, then the value of K will be about 35,000. If the support at each end is really rigid, the value of K will be about 75,000.

Musical Example

If a stretched string (as of a violin) be long, flexible, and pulled tight, then its rigidity will not affect its action, and the frequency of vibration per second will be $1/2L\sqrt{P/W}$, where L is the length of the string between the rigid supports, P the pull, and W the mass per unit length. This formula means that the number of vibrations per second will vary inversely as the length, directly as the stretching force, and inversely as the square root of the mass of the string per unit length.

It will thus be realised that there is a distinct similarity between electrical and mechanical resonance. If the length or diameter of the shaft, of the wire on the wireless tuning coil, or of the violin string, be varied, then the resonant frequency will be modified in each case.

Hoover Dam Scheme. By H. E. M. Kensit, M.E.I.C., Mem.A.I.E.E.

A hydro-electric power development on the Colorado River, U.S.A., to provide 750,000 kW, and irrigate seven million acres

THE Colorado River has its headwaters in the State of Wyoming and, after pursuing a tortuous course of 1,750 miles, it discharges into the Gulf of California. Seven States and a foreign country, Mexico, are directly concerned in the control and use of the water of this river, and ten years were consumed in negotiations to reconcile the various interests, but eventually co-operative agreements were made between the Federal Government and all the States (except Arizona), contracts were made for the entire output, construction was authorised, and development was commenced by the Bureau of Reclamation, Department of the Interior, in September, 1930. The total cost of the undertaking is esti-

Black Canyon, Colorado River

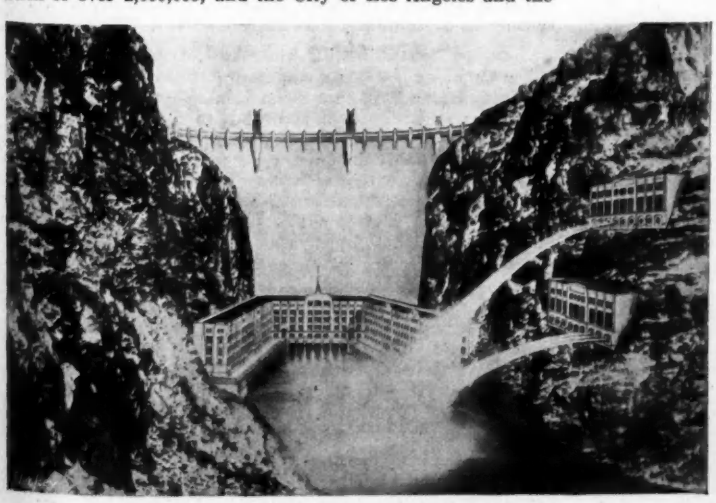
mated at £34,000,000, and it is calculated that the contracts entered into for water and power will repay the expenditure plus 4 per cent. interest in fifty years, less about £5,000,000 for flood control.

Flood Control and Irrigation

The Colorado River has a drainage area of 244,000 square miles and an annual discharge of 17,500,000 acre-feet. On the main river alone there are eleven power sites; its immediate tributaries bring the total to twenty-three power sites with a capacity of about 6,000,000 h.p. While most has been heard of the water-power development at the main site, the Hoover Dam, which is to supply from 1,000,000 to 1,200,000 h.p. in a single plant, the control of floods, the irrigation and water supply that will be provided by this dam are of equal, if not greater, importance.

The natural flow of this river, owing to summer drought and melting snow, varies from 1,200 to 250,000 sec. ft. and gives rise to disastrous floods over cultivated districts in spite of over seventy miles of "levees." The construction of the dam will secure a maximum discharge of 75,000 sec. ft. and a minimum of 10,000, and will enable the irrigation of 7,000,000 acres, of which 2,500,000 is now under cultivation.

The water supply side of the undertaking is also of considerable magnitude. Southern California now has a population of over 2,000,000, and the City of Los Angeles and the Metropolitan Water District of Southern California plan to take a thousand million gallons per day, and this will require 70,000 h.p. to pump against a head of 1,500 ft. The main canal to carry this water will be seventy-five miles long and in places 120 ft. deep; it will have several branches, of which one will be 115 miles long.



View of Power Station after Completion

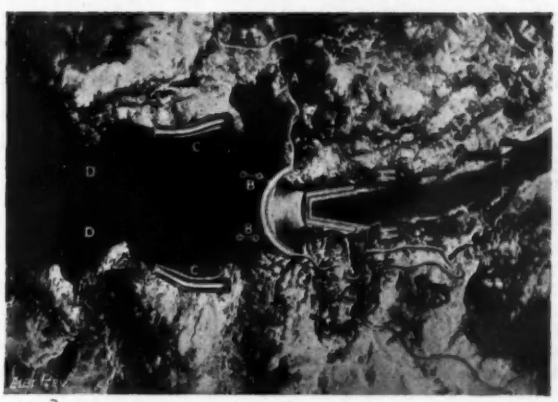
Eight Years' Work

It is estimated that the project will take eight years to complete. Before the construction of the dam can be commenced four diversion tunnels must be driven through solid rock, two on each side of the river, each 50 ft. in diameter and about 4,000 ft. long, and it is estimated that it will take till October, 1933, to complete these.

The dam will rise 727 ft. above bed-rock, will raise the level of the water 582 ft., and will give an average head of 520 ft. The total length of the crest will be 1,180 ft., and the dam will require a base 650 ft. thick. The reservoir so created will be 115 miles long and nine miles wide. In the air view reproduced the dam and other principal features have been drawn in; the lettering corresponds to the following: A, roadway between Arizona (top) and Nevada, crossing crest of dam; B, intakes for power house; C, spillways; D, intakes for diversion tunnels; E, canyon-wall outlet works; F, diversion tunnel outlets.

The Power Plant

The power house is to contain 85,000-h.p. units and will have a total capacity of 1,000,000 to 1,200,000 h.p. Parts of the diversion tunnels will be used to connect with other tunnels of the canyon-wall outlet gates and needle valves, from which the jets will discharge into the tail race as shown.



Air View of Hoover Dam under Construction

The construction work was submitted to tender and was obtained by the lowest bidder, "Six Companies Incorporated," of San Francisco, a combination of large western contractors. The power for construction will be obtained from California, the 225-mile transmission system being so constructed that when the contract is finished it can be used to transmit power from Hoover Dam to California.

A New City

The site of the Hoover Dam is in an isolated, arid and mountainous district. The nearest town is Las Vegas, Nevada, twenty-five miles distant, but a permanent town, to be called Boulder City, is being built eight miles from the site, and the railway and highway will be extended to the rim of the canyon, where elevators will be provided for both freight and workers. It is expected that Boulder City, even after the construction is completed, will continue to be busy, as, in addition to the considerable number of permanent employés to be provided for, it is hoped that there will be a large business in taking tourists to the dam and power house and in boating on the 250 square miles of lake that will be formed by the dam.

Dr. Wilbur, Secretary of the Interior, said in his dedicatory address at the opening ceremony: "This is one of man's greatest victories over nature. It is as if our country suddenly had a new State added to it, for a new and wider use of this controlled water will care for millions of people and create billions of wealth."

Canadian Electrical Matters

Hydro-electric developments in prospect and in hand: "Americanisation" and British trade

[FROM OUR SPECIAL COMMISSIONER]

AFTER being practically dormant for some time the question of the St. Lawrence River is becoming a live issue again. The Hon. W. C. Herridge, the Canadian Plenipotentiary to Washington, has been discussing recently, with Col. H. MacNider, the United States Minister to Canada, and with President Hoover, the matter of canalisation of, and power development from, the international section of the St. Lawrence.

The daily newspapers hint at the possibility of actual work being started next summer, but that seems to be too much to hope for, although it was intimated not long ago that the engineers acting for the two Governments had come to an agreement as to the method to be adopted for power development.

The Two Schemes

Readers of these notes will be aware that while Canada favours a two-stage power development on the river the United States, until a few weeks ago, was advocating only one stage. Now, it is reported, the American engineers have agreed to the Canadian plan. The advantages claimed for this plan are that, by building two dams instead of one only, considerably less land will be flooded, and a good deal of the total expenditure necessary can be spread over a longer period than in the case of the single-stage scheme; the actual total cost will, however, be a little higher. Navigational facilities, which are "paramount," would be properly provided for in either case.

Preliminary conversations between the representatives of the Governments concerned must necessarily be followed by the drafting of a definite treaty setting forth the conditions under which both power and navigational works will be carried out and the proportion of cost to be borne by each country.

With regard to the last item, as Canada has recently completed the construction of the Welland Canal* (at a cost of about $125,000,000), which will form part of the completed Great Lakes-St. Lawrence seaway, if and when the St. Lawrence is canalised, it has been proposed that this sum should be deducted from Canada's share of the cost of the St. Lawrence work. This will leave the United States to bear the bulk of the burden in respect of the work yet to be done in creating a through route for ocean-going vessels from Lake Superior to the Atlantic.

People who are opposed to this suggestion think that Canada would be well-advised to bear her full share of the actual expenditure required on the international section of the river, as she would then be a much freer agent in respect of control of shipping and water power than would otherwise be the case.

Chicago's Diversion

It is hardly possible for Canada to forget the manner in which the city of Chicago has for years been diverting 10,000 cu. ft. of water per second from Lake Michigan into the Mississippi River for sewerage purposes without having the least regard to Canada's rights in the matter of the disposal of the water of the Great Lakes; the States Government has itself on more than one occasion ordered the city to reduce the amount to 4,000 cu. ft. per second, but the diversion still goes on. Ten thousand cubic feet per second is the rate at which water flows over the "American" portion of Niagara Falls. Anyone who has seen these Falls will well realise the magnitude of the Chicago diversion.

The Beauharnois Affair

References to the great Beauharnois power development (500,000 h.p.) in the Quebec section of the St. Lawrence River have appeared in the English technical Press from time to time, and brief paragraphs have referred to the very disgraceful way in which the financial affairs of the company were carried on until a full investigation was made by the Dominion Government not long ago. No less a sum than $720,000 was paid into the coffers of one of the great political parties here, and several men, one of them a member of the Canadian Senate, managed to make some millions of dollars each out of the scheme, although the delivery of power is, even yet, in the future.

It is gratifying to find, however, that throughout this really "nasty" business the engineers have had a clean sheet—they have evidently done, and are doing, their share of the work as all members of the profession would wish to see it done—honourably and well. The delinquents have been removed by the Government from the financial control of the company's affairs, but the work is proceeding as before.

This is essential; apart from the necessity for keeping men employed in these difficult times, contracts have been made for the delivery of definite amounts of power from the Beauharnois development by certain dates in the near future.

Dangerous Water Heaters

Owing to the adoption by legislation of the Canadian Electrical Code in seven out of the nine provinces of Canada, it is becoming increasingly difficult for any one to sell, or otherwise dispose of, any electrical equipment, for ordinary installation work, which has not been approved either by the Hydro-Electric Power Commission of Ontario or the Underwriters' Laboratories of Chicago.

Several United States firms, however, have during the past few months found a means of disposing, in Canada, of a number of unapproved electric water-heaters of the geyser type.

In Ontario the Hydro-Electric Power Commission has just published a notice warning the public not to buy such heaters. The notice points out that—

> "Several unapproved and sub-standard types of electric water-heaters containing particularly dangerous features have been offered for sale throughout Ontario and probably other provinces during the past summer. . . . In all of these heaters the electric element is in contact with the water and usually consists of a coil of bare heating element mounted on a piece of asbestos wood, and enclosed by a perforated sheet metal case. This type is supplied with a length of rubber-insulated cord and is designed to be immersed in the water which it is desired to heat. Another type is designed for attachment to a faucet, but it is essentially the same in construction and contains the same hazards. . . . .
>
> "Tests have been made in the Commission's laboratory indicating that voltages from 50 to 110 exist between the water near the heater and the neighbouring grounded (earthed) objects such as a faucet."

Several agents have been prosecuted for selling, or attempting to sell, these devices, but some of them are not easy to lay hands on, because they drive around in a motor-car in the smaller towns and rural districts selling as they go, and they are in fresh territory every day.

Two More Important Developments

One of the large electrical developments in progress in Canada at the present time is that on the Lièvre river, in Quebec, where 130,000 h.p. will be available. Part of the work is the construction of a tunnel 29 ft. in diameter and 5,900 ft. long; about one third of this is completed, and all the work is said to be progressing satisfactorily.

The work at Chats Falls† development on the Ottawa River which is interprovincial (Ontario and Quebec) has progressed to the stage where the first four, out of eight, generating units of 28,000 h.p. each are about to be put into service, to supply power to, among other customers, the Hydro-Electric Power Commission of Ontario. Each turbine will take under full load about 5,500 cu. ft. of water per second at a head of 57 ft.

The transmission pressure is 220,000-V, and power will be sent as far as Toronto, about 250 miles away.

Exhibiting and Advertising

The Canadian National Exhibition, held in Toronto, was this year, as usual, a great success; and, in spite of present business conditions, British firms, according to information obtained by the writer, booked much better orders than last year. Unfortunately, this does not refer to British *electrical* firms for, with the exception of a very few having manufacturing facilities in Canada and incorporated as Canadian firms, no such firms exhibited at all, or, if they did, they must have hidden their lights under a bushel or some other equally effective form of extinguisher—they were not in evidence even in the official catalogue.

Again, most of the advertising of electrical equipment is either purely Canadian, by United States firms, or by Canadian firms of United States origin. It is little wonder that, in electrical matters, Canada is so "American." The American Institute of Electrical Engineers has various Canadian branches, but not so the Institution of Electrical Engineers, membership in which most men from the Old Country drop in favour of the A.I.E.E. after a few years' residence here.

* The Welland canal runs approximately parallel to the Niagara River, joining Lake Erie with Lake Ontario. It is one of the world's great artificial waterways.

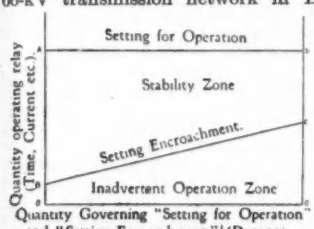
† Said by some to be so-called from the likeness of the original Falls to the paws of a cat.

Feeder Protection

The Interlock, pilot-less system

THE primary objects of protective systems are to isolate faulty mains immediately, secure safety and continuity of supply, and limit the stress on the network.

The Merz-Price protective system has proved itself in twenty-five years of operation to be sensitive, stable, and speedy in action, and it requires no voltage transformers, but its cost is heavy where long pilot cables are found to be necessary. In the form of split-pilot protection it is in use on the 66-kV transmission network in London.

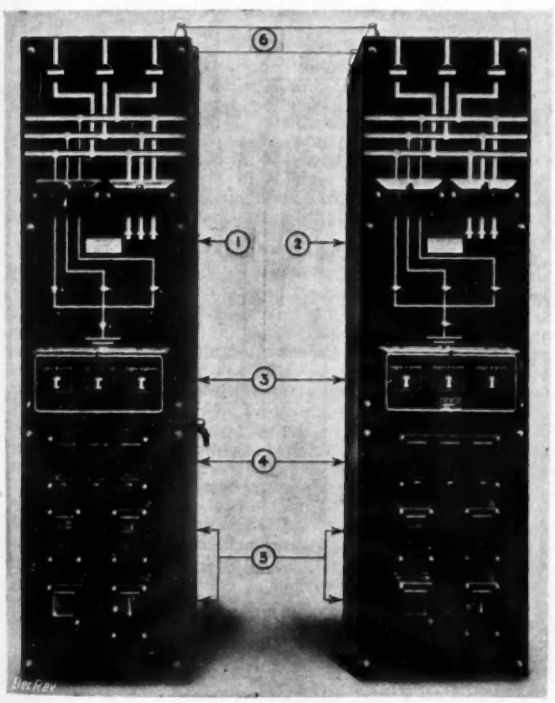

Setting for Operation
Stability Zone
Setting Encroachment.
Inadvertent Operation Zone
Quantity operating relay (Time, Current etc.)
Quantity Governing "Setting for Operation" and "Setting Encroachment" (Distance, Straight-Through Current, Frequency, etc.)

Fundamental stability diagram

Alternative methods are:—(1) The "ratio-balance" system which is based upon time grading and back-up protection, *i.e.*, its stability depends on the operation of the protective devices on other units, though it is without the long time-delays found with many other systems; and (2) the "interlock" system, which does not employ graded time-delays to obtain discrimination.

The ratio-balance system (whose operating characteristics approach those of the Merz-Price) was described in the ELECTRICAL REVIEW of August 30th, 1929.

For the interlock system an ordinary telephone pair is used,



(1) Relay panel at one end of feeder; (2) Relay panel at other end; (3) Directional stabilising relays; (4) Over-current relays; (5) Change-over, interlock, and tripping relays; (6) Pilot wires.

Interlock system equipment

which, however, is required only for the duration of a fault. Where no telephone lines are available the interlocking current may be superimposed on the power lines, as has been done on the Bedford-Little Barford section of the 132-kV grid.

Reducing System Stresses

The stress imposed on a network by a fault depends upon the time it persists; it is inappreciably affected by the fault setting of the protective gear, which does not prevent the current from rising instantaneously to its maximum value.

With a resistor-earthed network it is undesirable to have the earth-fault setting lower than is needful to leave a good margin below the permitted earth-fault current. Low settings are often unstable and are, at the same time, far too high to allow operation by incipient fault currents.

Earthing the neutral point through a resistor reduces stresses by:—(1) lessening the voltage rise to earth on the healthy phases; (2) limiting the fault current; and (3) providing, by the fault current in the main, a means for operating the protective apparatus immediately.

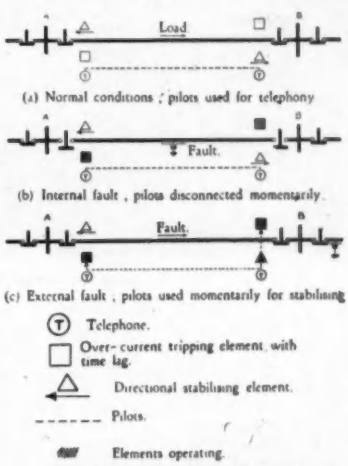
From 80 to 90 per cent. of network disturbances are due to earth faults, which can almost always be cleared before they develop into phase faults.

The criterion of quality of a protective system is its stability. In the diagram given above the stability zone represents the margin of safety by which the setting for operation exceeds the setting encroachment; the stability factor (in this case two) is the ratio between the two factors on the ordinate corresponding to the minimum ratio.

It is essential for successful operation that the stability factor of a protective system should be predetermined by tests that are fully representative of service conditions, in the manner indicated in the accompanying illustration. The equipment shown includes two sets of relays for both ends of a single feeder, the pilot wires having characteristics similar to those utilised in service, and auxiliary apparatus for simulating earth-fault and phase-fault conditions.

Principle of Operation

The principle of working of the interlock system is indicated in the key diagrams below. When a fault occurs on the feeder, diagram (*b*), the fault currents flow away from the bus-bars and operate over-current and earth-leakage relays (denoted by shaded squares) which isolate the feeder. With a fault external to the feeder, as in diagram (*c*), at the end B of the feeder nearest the fault the straight-through fault-current flows towards the bus-bars and operates a directional stabilising element (denoted by the shaded triangle) which interlocks the tripping element at each end of the feeder and prevents its isolation.

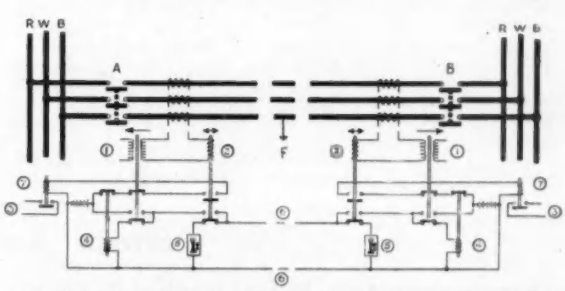


Principle of interlock system

During the fault period, the interlocking of the tripping element at the distant end, A, of the feeder is performed by a signal transmitted over a pilot circuit. The latter is "borrowed" by the tripping elements and then returned to its normal duty, as indicated in (*a*).

A typical application of the interlock system to a 3-phase feeder of any voltage, with existing telephonic communication between two stations, A and B, is also shown in diagrammatic form; secondary current and voltage connections are omitted.

When a fault occurs at F, the over-current elements momentarily isolate the telephone circuit and instantaneously energise the tripping elements, which close the circuit-breaker trip-circuit after a time-hesitation of 0.3 sec.



(1) Three-phase stabilising element; (2) Three-phase over-current element; (3) Trip circuit; (4) Interlock relay; (5) Telephone; (6) Pilot; (7) Tripping element.

Using an existing pilot circuit

With a fault external to the feeder at B, the over-current elements at A and B instantaneously borrow the telephone circuit, while the stabilising element at B similarly connects its battery to the pilot circuit at B, so as to operate the interlock relay at A.

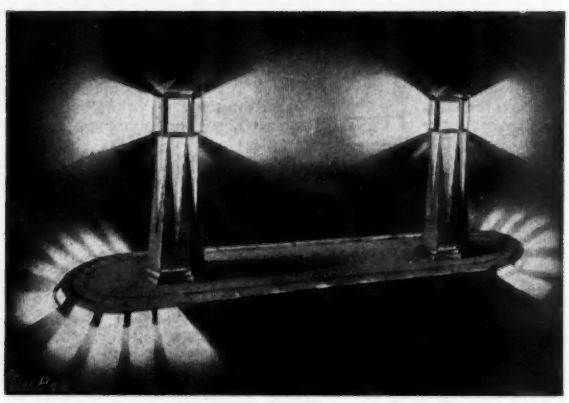
These instantaneous operations stabilise the protective system by de-energising the time-hesitation tripping elements at A and B long before either has had time to operate, thus preventing the opening of the healthy feeder. The time-hesitation of 0.3 second, divided by the time required for the so-called instantaneous elements to operate, gives a stability factor of 2, which is easily predetermined, and is uniform for all feeders protected on the interlock system.

Further information regarding the three protective systems referred to in this article may be found in two notable papers read before the last E.H.P. Conference, *viz.*, "Overhead Line and Feeder Protection," by H. W. Clothier, and "The Principles of Feeder Protection and Their Application to Three Modern Systems," by B. H. Leeson and H. Leben.

The Public Works Exhibition

ELECTRICAL interest at the Public Works, Roads, and Transport Congress and Exhibition, which is being held this week at the Royal Agricultural Hall, Islington, is centred chiefly in road traffic signals. Street control systems hitherto installed in this country have operated on the principle of a fixed time cycle, which, although adjustable, has no direct bearing on the varying volume of traffic.

The "Electromatic" system exhibited by the Automatic Telephone Manufacturing Co., Ltd., is, however, so designed that the vehicles themselves apportion the time to the various approaches in proportion to the relative density of traffic flow. An installation comprises detectors, a controller, and the conventional red, green, and amber lens lanterns. Each detector consists of two flexible steel grips placed below the road surface, suitably mounted and enclosed, which are forced into contact by the weight of passing vehicles, thus closing an electrical circuit to the controller. The latter is an arrangement of



An illuminated street island

relays and a ratchet operated by a camshaft which opens and closes electrical circuits feeding the signal lanterns in response to the detectors.

A car approaching an intersection with an existing right of way passes over the detector and by so doing extends the right of way period sufficiently to enable it to cross before a car approaching on the other road can itself secure right of way. When a car passes a detector in approaching, a stop signal (amber) is immediately displayed, and (provided there is no traffic on the other road, and that the vehicle is travelling at a safe speed) green right of way will be displayed by the time it reaches the intersection.

In the event of a car approaching an intersection when traffic is held up on the other road, if it passes the detector before the preceding car has cleared the crossing it will secure its own right of way. If, on the other hand, the preceding car had cleared the crossing, a gap would be created by the controller, and the waiting car on the other road given precedence, the right of way then reverting to the first-named vehicle.

A car approaching an intersection where the traffic flow on the other road is continuous starts a maximum period when it passes the detector. At the end of this period the continuous flow is interrupted and the waiting car given right of way together with others.

Other A.T.M. apparatus on view has been arranged to demonstrate practically the principles of flexible progressive control as defined by the Ministry of Transport. The controllers consist almost entirely of standard Strowger automatic telephone parts. Strowger private automatic and intercommunication telephones are exhibited.

Street traffic controllers, illuminated signs, etc., are also to be seen on the stands of Barber & Colman, Ltd., Chance Bros. & Co., Ltd., Gowshall, Ltd., Illuminated Road Signs, Ltd. (agents for Laurence, Scott & Electromotors, Ltd.), and the Revo Electric Co., Ltd.

The General Electric Co., Ltd., and the Siemens & General Electric Railway Signal Co., Ltd., are staging a joint display of a series of "Wembley" street lanterns of the dustproof and open types; units for the illumination of wharves, railway yard sidings, &c.; parade lighting lanterns for the high-intensity illumination of important shopping thoroughfares, and examples of decorative lanterns as installed in many public parks and promenades. Conversion units for use when changing over from gas to electric lighting are exhibited. Illuminated street name plates and traffic indicating signs of various types are also shown, together with illuminated neon signs for danger and traffic control signals, in red, yellow, and green, manufactured by Claude-General Neon Lights, Ltd.

The exhibits of the Siemens & General Electric Railway Signal Co., Ltd., comprise adjustable and fixed face signals for post and bracket mounting, pedestal signals for "island" location, sheet-metal signals, cast-aluminium signals, &c.

Hailwood & Ackroyd, Ltd., are showing a new illuminated street island platform, which is readily visible to drivers. Light issues from the edge of the platform through hinged segments, which are so arranged as to fold around the noses of island platforms of varying sizes. The posts are designed with deep tapered recesses which enable the light from the lamps in the heads of the posts to be reflected down the recesses, producing an illuminated column effect. Lighting fittings on view include ornamental standards and brackets, globes, traffic signs, metal stampings, and machined parts.

The Chloride Electrical Storage Co., Ltd., is demonstrating its "Keepalight" system of automatic emergency lighting for hospitals and public institutions.

New Distributors of Edison Storage Batteries, Ltd., have a selection of alkali accumulators and parts on view.

Electricars, Ltd., are exhibiting the only battery-driven vehicle in the Show. It is a 3.5-ton low-loading refuse-collecting vehicle of standard design, with steel sliding shutters and hydraulic end-tipping gear for East Ham.

Mawdsley's, Ltd., are showing a mobile 25 to 200-A single-operator arc welding outfit driven by a Ford engine; it is totally weatherproof, and the control gear is very neatly arranged.

Horstmann Gear Co., Ltd., is exhibiting time switches for public lamps. The Ingersoll-Rand Co., Ltd., includes in its exhibits a double-drum electric hoist designed for pulling as well as for scraping work; it is available in sizes of from 7 to 35 h.p. Motor-driven air compressors are also on view.

Fraser & Chalmers Engineering Works are showing a Sherwen screen, which is electro-magnetically vibrated by two solenoids mounted in a cast-iron case at the back. Its power consumption is remarkably small (less than 0.25 h.p.), and it needs no lubrication and is easy to operate.

Tangyes, Ltd., include on their stand a vertical-spindle pump driven by a Laurence, Scott motor, and a two-gun car washer by the Electrical Power Engineering Co.

One session of the Congress (on Tuesday last) was devoted to a paper on "The Extension of Electricity Supplies, with Special Reference to Rural Districts," by Mr. E. W. Dickinson, rural development officer of the Electricity Commissioners. Capt. J. M. Donaldson, president I.E.E., took the chair.

The German Radio Valve Industry

A BERLIN correspondent reports that it is rumoured in connection with the Wireless Exhibition in that city that important agreements have been concluded between the leading producers of radio valves, which will presumably result in a great reduction in competition and a mutual regulation of the various problems associated with the sales business.

In the first place it is stated that an agreement has been reached for the transfer to the Telefunken Company of the whole of the radio valve business of the Tekade (South German Telephone Apparatus, Cable and Wire Works Company), and that both production and sales in future will be concentrated in the former company. In the matter of the manufacture of radio valves the Tekade in future will only be occupied with the production of special valves for film apparatus and very powerful types.

Apart from this arrangement it would appear that negotiations have also taken place between the Telefunken Company and the Falvo undertaking with the object of coming to an understanding in the matter of radio valves; the latter concern is closely associated with the Philips Company.

The Telefunken-Tekade agreement is said to introduce a new policy in the whole radio valve industry. Although certain loose arrangements have hitherto existed between the chief undertakings, and a "gentlemen's agreement" has ruled with regard to prices and technical problems, it is said that in the open market very keen competition has prevailed. At the head of the valve industry is the Telefunken Company with more than one half of the German turnover; next in order stands the Falvo; and the third position is occupied by the Tekade. The scope of the other makers of radio valves is restricted to various products, particularly rectifier valves; and in this connection mention is made of the German Philips Company and the Rektron.

The correspondent further states that the agreement between the first three undertakings mentioned would practically imply a complete regulation of the market. The Tekade, which is included in the sphere of interest of the Felten and Guilleaume Company, has a capital of 3,000,000 marks which is all held by the latter group. In the case of the negotiations with the Falvo, however, there is stated to be no question of this undertaking discontinuing production. An agreement with it would presumably assume the same form as the agreement recently entered into between the Philips and Osram concerns in the matter of neon tubes, or be restricted to technical questions and price arrangements.

The tendency towards concentration in the radio valve industry is of special interest, the correspondent says, when it is considered that important patents will expire in 1934, when unbridled competition may be expected in which the Americans will participate. As a consequence a beginning has already been made in the elaboration of measures to prevent keen rivalry among the German works after the lapse of the patents.

Some New Electric Fires

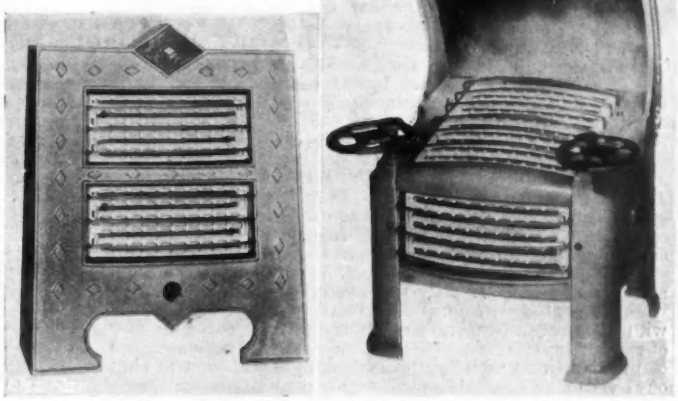
Further models recently put on the market

SINCE our Special Domestic Issue appeared last month, containing illustrations of a few of the many types of electric fires which are now available, several other manufacturers have drawn our attention to designs, some of them very original, which they have recently added to their ranges.

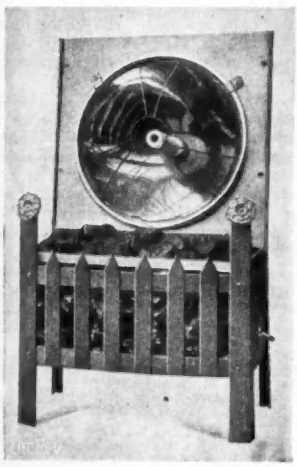
Included in a number of attractive fires by Messrs. H. G. Moseley & Co., Ltd., are the "Diamond" and "Super Trivet" models.

An attractive feature of the "Diamond" is the portion of the case dividing the elements. The fire bar is of convex construction, and a protection guard completes the equipment. It can be obtained in vitreous enamel or oxidised copper.

The "Super Trivet" is built for endurance. The trivets can be swung round over the fire or to the sides to act as stands for utensils for boiling or simmering. The reflector is of polished stainless steel, and the convex bars at the top and front of the fire are protected by guards. It is available in two sizes—2 and 3 kW—and in finishes of black and vitreous enamels and oxidised copper.



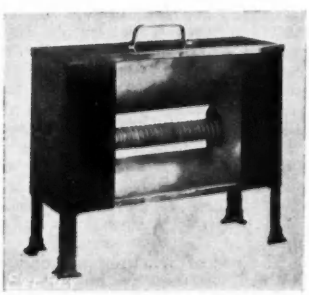
The "Diamond" and "Super-Trivet" models



Combined "coal" and bowl fire

Messrs. Lane & Girvan, Ltd., have sent us particulars of a range of new electric fires, including some of novel and attractive design. Among these is model No. 220, which has been designed particularly for use in drawing-rooms and lounges of moderate size, the imitation coal presenting a cheerful appearance. It is available in two finishes, oxidised copper and chromium plated, with dimensions of 24.5 in., 19 in., and 12 in. deep. The loading is 1,500 W.

A compact little single-bar, "No. 198," is intended for sitting- and bedrooms, and it is especially suitable in enamel finishes for harmonising with a wide variety of colour schemes. The loading is 1,000 W. "No. 210" is an addition to the company's popular reflector models, and is fitted with a hammered chromium-plated reflector. It has strong screw-in elements. It is available in stove black with plated facings, or in any of the company's cellulose finishes. The loading is 2,000 W, and the dimensions of the appliance are 18 in. by 12 in. by 10.5 in. deep.

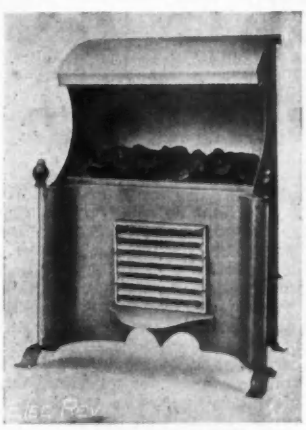


The "Tu-Ways" heater

The design embracing a "coal fire" and a parabolic reflector, "No. 230," is believed to be unique, and is intended for the drawing-room or lounge. It has strong screw-in elements and is available in four different finishes—oxidised copper, chromium plating, rustless steel, and satin brass. The loading is 750 W, and the dimensions are 25.5 in. by 15.25 in. by 13.5 in. deep.

By means of a double-sided reflector in the "Tu-Ways" radiator, introduced by Bratt Colbran & Co., and the Heaped Fire Co., Ltd., heat is projected both to the front and the back of the fire. The element is of the plug-in type, and has two-heat control by foot switches. It is made of polished stainless steel, and measures 15.5 in. by 18 in. by 6.5 in. deep.

We illustrate two of a number of attractive fires supplied complete with surrounds by the same companies. The "Berlin Black" radiator is constructed in a 3-in. by 3-in. plain glazed enamel tiled slabbed surround with black angle beading, and slabbed ready for fixing. It measures 25½ in. by 37½ in., and being only 3¾ in. deep it may be fitted practically anywhere. The maximum projection when fitted is 1¼ in.

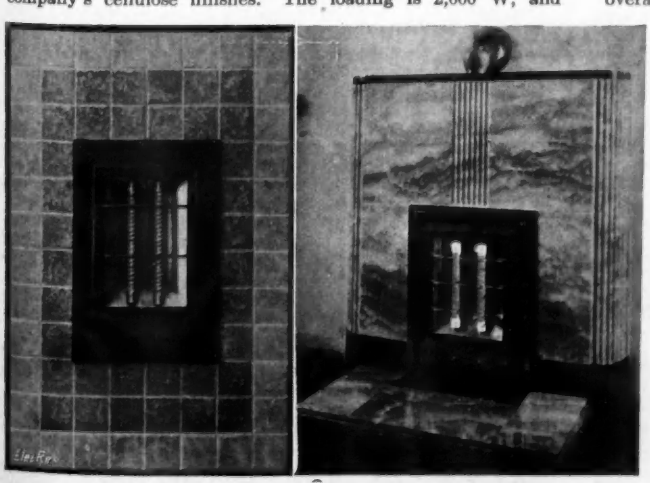


An unusual design ("No. 230")

The two plug-in elements have a total loading of 1.5 kW, and each element is controlled by a separate foot switch. The fire can be supplied in rustless steel, bronze, brass, copper, polished aluminium, and other finishes.

Another model has a mantel of polished Napoleon marble, with Belgian black marble plinths and shelf. The hearth is raised 2 in. above the floor, and is of similar material. The overall size is 47½ in. by 49 in.

The black radiator is set in a non-rustable steel interior and measures 20¼ in. by 26¼ in. It is fitted with two 1.5-kW plug-in elements, each controlled by a foot switch.



Fires supplied complete with surrounds

Electrotechnical Letter Symbols

In spite of the fact that the International Electrotechnical Commission published a list of international letter symbols as long ago as 1920, many writers still use their own symbols and abbreviations for electrical units and quantities. With a view to securing greater uniformity, "British Standard Letter Symbols" has now been issued as a separate publication (No. 423-1931) by the British Engineering Standards Association. The symbols are, with one or two exceptions, identical with those recommended by the I.E.C. Publication No. 27. It should be noted that the type faces employed for the symbols are shown as examples only, and other type faces may be used if more convenient.

A comprehensive British Standard List of Symbols and Abbreviations used in engineering is at present in preparation, and the British Standard Letter Symbols will form a part of the electrical section of the more comprehensive list. Copies of the publication can be obtained from the Association, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Gas Instead of Oil in High-voltage Cables

THE advance in the construction of high-voltage cable installations represented by the use of the gas-pressure type of cable was dealt with in a long paper read by Messrs. M. Hochstadter, W. Vogel, and E. Bowden at the ROYAL SOCIETY OF ARTS in London on November 17th.

Nitrogen is used preferably as the pressure medium, as it has a quenching effect on flame in the event of a serious fault. The system is ideal for protecting the cable mechanically, and such a cable and its accessories are extraordinarily simple, as compared with the complications of the oil-filled cable, since no stop-joints, pressure tanks, or expansion tanks are necessary.

Using gas as the pressure medium, it is possible to deal with all differences of level likely to be encountered in a cable network without any inadmissible differences of pressure. Even with the greatest temperature differences which occur, no flow of gas into or out of the pipe line is necessary. In consequence of the high compressibility of the gas, it is sufficient to shut off the gas-filled pipe line and leave it without expansion vessels to the changes of temperature occurring in operation. Under these conditions a temperature difference of 50° C. will only produce a pressure variation of about 1 atmosphere, which is negligible for the effect of the pressure on the cable.

ADVANTAGES AND PROSPECTS.

The great technical and economic advantages of the pressure cable seem to suggest to the authors that this is not merely an advance in cable technique, but that it offers the possibility of competing with overhead lines in different fields, in which the latter has hitherto had a monopoly. It seems possible that the pressure cable may initiate in the realm of power transmission a transformation similar to that which many large telephone networks have undergone in the substitution of underground cables for overhead lines.

The authors explain that by reason of its stability this type of cable can be loaded up to its economic limit without regard to the heating of the insulating material. It therefore allows, for long-distance transmission, an increased loading up to at least 1.4 times that of the normal cable; for short distances, where the voltage drop is not the limiting factor, the loading may be 1.6 times that which has hitherto been possible.

Through the raising of the time-voltage characteristic the operating voltage can, with perfect safety, be raised to more than twice that permissible with normal cables having the same thickness of insulation. The power that can be transmitted is, in consequence of these improvements, from 2.4 to 3.2 times that of a similar normal cable. This advantage becomes the more important from an economic standpoint as the operating pressure increases, since the cost of the pipe line becomes a smaller proportion of the total cost. The advantage is outstanding at operating voltages of 30 kV and higher if only the capital investment and its relation to the load that can be transmitted be considered.

LOADING AND INSTALLATION COST.

As an example, a 25-kV " H " cable of 3×95 sq. mm. copper section and 7 mm. insulation may be loaded with 220 A, corresponding to a load of 9,500 kVA. Taking the capital cost per kVA (excluding excavation and reinstatement) in this case as unity, then with the same cable as a pressure cable operated at 50 kV and 300 A, *i.e.*, carrying 26,000 kVA, the cost per kVA that can be transmitted would be only 0.55. The installation cost per kVA is therefore almost halved.

It must, however, not be overlooked that in the latter case the transmission losses would amount to 60 kW per km., instead of 30 kW per km. How far the total economic result would be affected by this depends on the influence of generating costs and load factor on the annual operating costs. It is therefore impossible to generalise as to the total economies of the matter and for this purpose each case must receive separate attention.

Quite independently of the above considerations of total economy, however, the pressure cable offers considerable advantage over the normal cable even with equal cross sections of copper and at moderate operating voltages as low as 25 kV to 30 kV. Even if the pressure cable should be shown to be not materially lower in price, it offers the important advantage of quality, which, by reason of its high stability, can be overloaded to the extent of 50 to 60 per cent. This gives a substantial reserve for overloading in cases of emergency, even if the cable be not run at such a high load in normal operation on account of economic considerations. In all such cases, and they are numerous, a pressure cable can be installed with smaller copper section than has been possible hitherto with the normal type of cable.

The capital costs of a normal cable installation for from 60 to 100 kV and an overhead line for the same pressure are as 2.5 : 1. By the use of the pressure cable this ratio should be reduced to about 1.4 : 1, that is, the capital cost of a pressure-cable line should be only 40 per cent. greater than that of an overhead line for the same working pressure and carrying capacity.

Continuous Voltage Regulation

A PAPER presented by Mr. Hugo W. Biskeborn before the London Local Technical Group of the ELECTRICAL POWER ENGINEERS ASSOCIATION on November 10th reviewed non-mathematically the conditions that have necessitated the development of continuous voltage variation on networks and interconnectors, and outlined the methods adopted.

A situation is now being approached which will necessitate other factors than the simple control of the transformer ratio being considered. With the development of the national grid careful thought must be given to the application of on-load voltage control, for conditions may occur under which the use of voltage regulators will cause serious trouble, give rise to system instability, and tend to accentuate the very conditions which the equipment is designed to obviate.

Its sphere of operation has been widened from that of solely maintaining close limits on the low-voltage system, for interconnection has necessitated wattless kVA and phase control.

Of the transformer methods, the simplest and most favoured is the auto-choke with an off-load selector switch mounted internally, and external circuit breakers. This method avoids any departure from straight transformer winding, and does not interfere with the latter's design or performance. Being designed to withstand full-load current continuously, no damage will occur in the event of the control gear stopping.

In this country and in Europe the induction regulator is losing ground due to its unfavourable operating characteristics. In general it does not bear comparison with the transformer method when more than 10 per cent. variation is required, or when regulation is desired at pressures higher than 11,000 V. Additional disadvantages become apparent with heavy kVA and noise and vibration in the larger sizes have not been overcome.

The use of synchronous condensers in this country is very limited, but they are more generally employed in Europe and the U.S.A., as their inherently favourable features when used on long transmission lines are negatived on short lines. The chief disadvantage of condenser equipment in this country would be its capital cost.

Contractors' Aids and Grievances

TO stimulate discussion, Mr. F. C. Raphael made the paper which he read before the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS on November 17th as controversial as possible.

He gave it as his opinion that for first-class work in new buildings in which the client or the architect desires all the wiring to be concealed screwed barrel conduit comes first. Lead-covered wiring has been laid successfully in carcass buildings, but it is a risk which he prefers not to take.

He is not one of those who believe that one is right to assume bad continuity in grip fittings, for with good workmanship there is absolutely no reason why the electrical resistance of the conduit runs should not be even lower than that of screwed joint. It is sometimes forgotten that light-gauge conduit does not necessarily imply the variety known as ordinary close joint.

Mr. Raphael has never cared to run c.t.s. cable in walls to be plastered over, or under the floors of ferro-concrete buildings; moreover, under modern conditions, it is almost impossible to foresee what fittings, accessories, and portable appliances may have to be earthed eventually, so to be on the safe side one would have to employ cable with an earthing wire throughout.

Conduit's chief drawback is that it is not watertight; some plastic and electrically conducting compound is needed, and until such a material is found, there are two moderately expensive safeguards which can be applied: one is to treat every joint with bitumastic paint or something similar after it is completed, and the other is to combine some sort of a pin grip with a screwed joint. In the latter case the joint would be made boldly with red lead, a suitably shaped countersunk grub screw would be relied upon to make good electrical contact with the socket, and a contact surface would be cleaned away on the top of the tube.

There is a regulation that the resistance of a run of conduit from end to end must not exceed 2 ohms. In sunk work it is not much use waiting for the reception test; conduit cannot be dug out after the floors and walls are made. To be on the safe side, the resistance of every run of conduit from each sub board should be tested as soon as it is completed, and before the cables are drawn in.

For this purpose Messrs. Everett, Edgcumbe & Co., have made for the author a simple instrument, consisting of a dry battery, an ammeter with a special scale and calibration, and a pair of long leads of fixed resistance. On open circuit the needle is off the scale, beyond the largest reading; on short circuiting the leads and depressing the key the calibration is such that the needle goes to zero; and on including the conduit in the circuit, the resistance of the conduit is shown in ohms when the key is depressed.

An American system, introduced to the author a few years ago by Mr. H. J. Rowse, a Liverpool architect, and the Key Engineering Co., Ltd., has been selected for large new office buildings in Liverpool and London. Its object is to solve the problem of fitting an electrical installation into a large ferro-concrete building when there is not the remotest idea where the lighting points (and incidentally also the telephone points) will ultimately be required, or the size and shape of the rooms that will appear when the partitions are formed.

THE KEY SYSTEM EXPLAINED.

In the Key underfloor duct system, D-shaped insulating fibre ducts are laid in the floor, the bottom of the D being protected from the concrete by a pad of impregnated asbestos; the joint between the asbestos pad and the fibre duct is made watertight with hot bitumen. They are laid to form a grid in the floor, the centres being from 5 to 8 ft. apart in one direction, and from 40 to 60 ft. apart in the other. At the intersections iron boxes are sunk in the floor to serve as draw boxes. The covers of these boxes are recessed to take the floor covering employed, a brass rim serving to indicate the line of the duct after the floor is made.

Wherever an outlet is wanted a circular hole is cut in the floor by means of a special tool (which reaches just far enough down to cut a hole in the crown of the duct) and a brass inset is inserted and grouted in. This has an outlet threaded for conduit, which is continued to the plug or lighting point in the ordinary way.

An earthing terminal is fitted to the inset, and an earthing wire can be run back if desired. Wiring is carried out in the usual manner with v.i.r. taped and braided cable, drawn into the ducts and looped from point to point.

CABLE MAKERS CHIDED

The author's chief complaint against the cable makers is that they have "not made the slightest effort" to help contractors to get over damp conduit trouble. They say that their cable is waterproof, but not proof against iron rust.

His theory is that the vulcanised rubber of the class used on cables becomes porous when subjected to severe or prolonged tension. Now, if the cable is drawn in by pulling on the conductor, there will be uneven tension on the rubber if the cable is held up anywhere; pulling on the conductor will have the effect of trying to tear it away from the rubber, and the adhesion of the rubber to the conductor varies throughout its length. If the cable is drawn in by pulling on the rubber, it will be stretched.

If a cable is left in tension or compression, for instance, by being bent round a sharp corner of metal, or by being clipped by the cover of a box, or pressed hard against the holding-down screw of an accessory, the rubber will gradually recede in time (sometimes the process will take a year or two) and eventually cause an earth. It is possible that similar damage is done to the structure of the rubber in drawing in, and that the stress administered to it, and the strain produced, leaves it permanently porous.

Another grievance against the cable makers is their maintenance of the "absurd method" of grading according to insulation resistance. The author challenges any cable maker to let him cut off twelve samples of cable of the three grades, turn his back while the braiding and the printed tape underneath are removed, and then turn round and correctly identify which is which.

STANDARD ACCESSORIES SAVE MONEY

Accessories are fortunately becoming more and more standardised, and standardisation is taking a practical form. In selecting accessories it has to be remembered that the saving of labour can be of more importance than saving in first cost. Five minutes' work costs nearly twopence; if the man is working with a mate, it may cost over threepence. If, for instance, it takes a man ten minutes to fit a competitive metal cord-grip lampholder, and he can fit a modern two-piece bakelite holder in five minutes, it is cheaper to use the latter even if it costs two shillings a dozen more.

Platinum and its Alloys

THE history, occurrence, purification, metallurgy, properties, and uses of platinum were described in a paper read by Mr. Donald McDonald before the SOCIETY OF CHEMICAL INDUSTRY, Chemical Engineering Group, in London on November 13th.

The three chief sources of the metal are the alluvial deposits in Russia and Colombia, the copper-nickel ores in Canada, and the primary deposits in South Africa.

Normally the richer sands and ores are refined by wet and electro-chemical processes, the recovery of minute traces of valuable materials being remarkable. The modern method of melting platinum on a commercial scale is by high-frequency induction furnaces, the vigorous electro-magnetic motion of the melt being an admirable promoter of good alloying.

There has been, however, great difficulty in obtaining melting pots to withstand the high temperature, and casting is not always easy.

The electrical industries still depend on platinum to a very considerable extent, but not quite so much as when it was the only metal which could successfully be sealed through glass to give an air-tight joint in the manufacture of electric lamps, for efficient substitutes have long since been discovered. For all types of contacts, however, when absolute reliability is required, especially if arcing is likely to take place, its freedom from oxidisation and high melting point make platinum still indispensable, although under carbonaceous or oily conditions trouble sometimes arises.

Where the mechanical load is light pure platinum may be used, but when a heavy load is imposed, as in magneto contacts, it is hardened by the addition of iridium according to circumstances. In extreme cases up to 30 per cent. of iridium is used, to give an alloy with a Brinell hardness of 250 in the annealed state. All these metals lend themselves readily to electrical spot welding operations, and economy may be attained by welding relatively small contact tips on to steel bases. The uses of such contacts are, of course, legion, a few being in magnetos, telephones, detonators, signals, automatic signs, etc.

Rhodium is occasionally used as a hardening alloy for platinum on the grounds that these alloys maintain their hardness on long exposure to high temperatures much better than any of the other alloys, since the rate of recrystallisation is retarded. An alloy containing 20 per cent. of rhodium is used for the windings of high temperature electric resistance furnaces.

Fine wires made from certain alloys of platinum with cobalt and nickel are used for the filaments of certain types of wireless valves. It has been found that these alloys exhibit maximum emissivity.

How to Make Rural Electrification Pay

THE design of a distribution system to cover an area of 400 sq. miles for a "model" rural electrification scheme is worked out in a paper read by Messrs. E. W. Dickinson and H. W. Grimmitt before the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 19th.

Capital expenditure and revenue over a period of years are estimated and the authors' conclusion, based on such statistics and data as are now available, is that the electrification of sparsely populated country districts is practicable from both the technical and financial aspects.

The subject needs to be viewed more broadly than it has been in the past; pioneer work has pointed the way to further considerable development on a more standardised and more economical basis than hitherto. The greater uniformity and lowered cost of grid bulk supplies may result shortly in such agreed terms as will make the financial results more certain and render possible the extension of the radius of economical development.

KEEPING DOWN CAPITAL COSTS.

Efficient distribution and the kind of service organisation needed for the adequate sale of electricity require examination, for an increasing proportion of capital is being expended on distribution as compared with generation.

Notwithstanding the greater sale of electricity year by year, the number of kWh sold per £ of capital tends to decrease.

The need in Great Britain for special measures for keeping down capital costs will be apparent when it is pointed out that the average density of population in rural areas is only 115 persons per sq. mile, as compared with 4,907 for the remainder of the country. Standard voltages and the simplification and standardisation of equipment are inevitable.

The authors are definitely of the opinion that the unit of area must embrace practically all the sources of revenue to be found in the countryside, including villages and one or two small country towns, and most of those "outside" sources referred to as "isolated consumers." If rural electrification be taken in hand sporadically over small areas, or on the basis of supplies being given to the more lucrative villages and semi-urban districts, or to large individual power users chosen because of the immediate prospects of revenue, the problem of a general public supply over wide rural areas, i.e., a supply by which all classes are catered for, becomes much less capable of satisfactory solution.

THE ECONOMIC AREA.

The area must be large enough to provide revenue of sufficient magnitude to command the services of good technical and business men and to permit of ample canvassing and publicity services. As regards control and inspection during operation, a radius of about 10 miles would appear to be workable. Within such an area a "tertiary" pressure of 11,000 V over which a secondary pressure of 33,000 V is superimposed presents no serious difficulties in the transmission of energy. Such an area would appear to represent the minimum size; in the authors' view not less than 400 sq. miles should be considered for electrification, and multiples of this up to three or four times might quite conceivably give better results.

Rural areas in Great Britain over which distribution powers are held ("occupied areas") are about 48,000 sq. miles in extent, with an average density of 162 persons per sq. mile. In England and Wales only there are about 38,000 sq. miles of such areas with an average density of 176 persons per sq. mile. Of this there are about 8,000 sq. miles, or 21.5 per cent. (reckoned by parishes), in which electricity is available; such areas have densities of about 375 persons per sq. mile.

In the remaining 30,000 sq. miles in England and Wales over which distribution powers have been obtained, but in which electricity is not yet available, there is an average density of

123 persons per sq. mile. Within this area there are extensive areas of such average densities of population as to offer good prospect of electrification.

REVENUE AND CHARGES.

The average revenue actually obtained for all purposes during 1928-29 from consumers connected to the mains of all authorised undertakings in Great Britain was £15.7; of this 43 per cent. was revenue from power. The average revenue for all purposes actually obtained during 1929-30 from consumers connected to the mains of 221 authorised undertakers from operations in rural areas was £12 per consumer; 50 per cent. of this was revenue from factories and large consumers. The revenue estimated from the authors' "model scheme" ranges over a period of six years from £5.31 per consumer in the first year, to £10.06 in the sixth year.

The wholehearted co-operation of authorised undertakers with manufacturers and contractors and with the Central Electricity Board is essential for the solution of the problem of rural electrification. Any reduction in the charge per unit to consumers will lead eventually to increased sales and greater revenue, and by the courageous application of a tariff under which the charge for electricity is reduced pro rata to consumption, it can confidently be hoped to tap large sources of revenue.

In the design of equipment for a scheme of rural electrification, designers should look well ahead of present requirements and equipment should be projected for the area as a whole. This is recommended in preference to the sporadic development now largely adopted.

BULK BUYING ESSENTIAL.

The best pressure for high-voltage distribution in rural work with scattered loading is 11,000 V. The cost of overhead lines and equipment can be reduced to the minimum by standardisation, bulk purchase of material, and such preparations as will ensure continuity of construction.

No adequate reasons are apparent why electrification should not, in areas over which powers of supply are held and are not yet electrified, be proceeded with at once. With goodwill and co-operation electrification can proceed on a sound financial basis, even in areas having average densities of population little above 75 per sq. mile.

Electric Welding: Merits and Limitations

A PAPER read by Messrs. E. W. Thompson and A. Jeavons before the INSTITUTION OF WELDING ENGINEERS at Birmingham on November 13th was general in nature rather than full of technical detail.

The authors express the belief that one of the most important points in producing a satisfactory welded vessel is correct annealing and this procedure cannot be given too much attention. With some awkwardly shaped vessels which may be electrically welded, particularly large receivers, distortion at high annealing temperatures may occur, in which case raising them up to 580 or 650 deg. C. will suffice to remove all strains which are set up either in the bending of the plate itself or in the welding.

A riveted drum may cost from £40 to £50 per ton; a forged one from £60 to £150 per ton, depending on the size; but a welded drum may cost less than £40 per ton. There is a great future for electric welding, but much further progress will have to be made before boiler-makers can be certain of that method for high-pressure vessels. Still larger electrodes, even up to 0.75in. in diameter, will have to be used for thick materials.

Welding metal can now be deposited with a ductility, elongation, and tensile strength equal to those of the parent metal; and it can equally well be hot forged, bent, rolled, and cold worked. The authors consider X-ray examination to be very necessary, and their tests and practical commercial work have forced them to the conclusion that the single "vee" weld is much superior to the double "vee" type; there is always a danger of incomplete penetration into the central area of the double "vee" weld.

Protection Against Lightning

AT the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS on November 9th, Mr. J. F. Shipley opened a discussion on "Lightning Protection, especially in Tropical Countries," and showed a number of remarkable lantern slides of thunderstorms in stages of generation, development, and operation in several parts of the world. He also had charts and diagrams setting out the influence of geological formations on air currents and on the charged atmosphere. Electrification by the friction of dust storms was described and the phenomenon of coal-dust combustion was hinted at as an analogous consequence similar to the static charge induced by friction.

Describing an extensive overhead system in a stormy district of West Africa, Mr. Shipley said they found that strokes were nearly all direct to the suspension points at the top of the towers, and sections of the line were at first "over insulated" so as to locate the breakdown to accessible spots; by improved insulators and arrestors they had very appreciably reduced breakdowns and had so protected the line that the switchgear was now the danger point.

The part of the world where thunderstorms were most frequent was Java, lightning occurring on about two out of every three days throughout the year, while it was also stated that in England and in industrial districts of the world the voltage of lightning was several million volts less because of the impurities in the atmosphere. Mr. Shipley disclaimed any knowledge of the affinity of lightning for particular metals, but he pointed to frequent fatalities to cattle both at home and abroad in the neighbourhood of wire fences mounted on wooden posts.

At Other Meetings

A SHORT-WAVE broadcasting transmitter and its essential auxiliary circuits are described in a paper Mr. W. R. Bishop read before the London Students' Section of the INSTITUTE OF ELECTRICAL ENGINEERS on November 13th.

The control-room equipment is first dealt with, the A, B, and C amplifiers, and the low-frequency circuits. The submodulative valves are of the M.T.7B. type and the main modulators of the C.A.M.3 type, two each in parallel; the latter have an anode voltage of 10,000 V and a current of 0.9 A, the negative grid bias necessary to fix these values being of the order of 1,400 V.

Next the high-frequency circuits are described, with the Marconi-Franklin constant-frequency drive circuit, and a series of subsequent magnifiers, which are coupled together in valve-bridge formation. Mechanical symmetry exerts a major influence on circuit stability, screening, careful earthing and sound electrical contacts being also essential. The "uniform" type of aerial is described together with the method of terminating the feeder to avoid the formation of "standing" waves.

The power supply, value and machine characteristics, and the factors governing choice of methods are outlined, while maintenance, operation, and service problems are also touched upon.

Electro-Farming

Under the auspices of the GLASGOW AND WEST OF SCOTLAND AGRICULTURAL DISCUSSION SOCIETY on November 11th, a lecture on "The Application of Electricity to Agriculture" was delivered by Mr. F. C Rowland, agricultural manager, General Electric Co., Ltd., London.

Earthed or Insulated Neutral?

At its meeting at Cardiff on November 14th the South Wales Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS resumed the discussion on Mr. J. Jones's paper on "Fault Protection," which centred round the question of earthed *v.* insulated neutral. The consensus of opinion was in favour of an earthed neutral; while there was a natural reluctance to change over from an insulated system which had been in use for many years, from the experiences of several members it was apparent that any fears of added trouble were unfounded. They claimed that since the change-over they had suffered less from breakdowns. It was impossible to apply leakage protection with an insulated neutral, and to provide real leakage protection as suggested in the Coal Mines Act it was very necessary to earth the neutral in order to protect adequately the various machines and feeders of the system.

Radio and Shipping

Mr. D. Alan Stevenson, in a lecture on November 10th at the ROYAL SCOTTISH SOCIETY OF ARTS, Edinburgh, dealt with "The Navigation of Ships During Fog." The lecturer described different forms of wireless communication which, he considered, had come to stay as an essential aid to navigation. There was now nearing completion round the British shores a chain of 500-W radio beacons, and the advantages and objections were stated regarding this and other forms of wireless, such as the revolving reflector beam and the revolving loop. The leader cable and submarine signals were also referred to, and it was remarked that responsible lighthouse authorities in the United States and Canada had expressed the opinion that submarine signals would in the future have no place in navigation. The talking beacon, which had been an unqualified success since its establishment at Cumbrae lighthouse, on the Clyde, was described.

A Faraday Lecture

At the monthly meeting of the North-West Midlands Branch of the ELECTRICAL ASSOCIATION FOR WOMEN held in the electricity showrooms at Stoke-on-Trent on November 12th there was a full attendance to hear Mr. C. H. Yeaman, city electrical engineer of Stoke-on-Trent, deliver a lecture on "The Life and Discoveries of Michael Faraday and their Consequences." The speaker illustrated various points with lantern slides and experiments.

Modern Transport

At an informal meeting of the INSTITUTION OF CIVIL ENGINEERS in London on November 11th "Modern Means of Transport" were discussed. Mr. Mervyn O'Gorman described the economic relationship of road and railway traffic, and urged greater appreciation of the value to the community of the great national asset of 180,000 miles of roads, which represented a capital of over a thousand million pounds sterling.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

A Consumer's Points

Now that "Old Bones" has raised the real issue about plugs, I think that, having fixed plugs of every kind yet made in good and bad positions, I can state without a doubt that the best value for money and the neatest is the sunk wooden box-type switch-plug. It should be fitted in a position near the fire or other apparatus which is going to be used. This type involves less flex and less trouble, and is easier to fix in the skirting than the surface type.

The most serious fault about switch-plugs is the fact that testers do not ascertain if the live side is switched, especially on three-pin plugs, and irritating faults arise.

For writing desks, sideboards, bed tables, etc., the plugs require to be slightly below the height of the piece of furniture; they are then nearly always concealed. Three-amp. wall sockets working with switched lampholders are unbeatable for convenience, price and neatness.

The real trouble about the plug question is that when the fitter, canvasser, or foreman goes to estimate or to wire a job, he does not visualise where the furniture is going to stand. In the majority of houses and buildings, the positions for beds, sideboards, fires, wall plugs, etc., are or should be quite obvious.

NEAT.

November 16th, 1931.

Canvass the Country

I feel that I must congratulate you on your leading article, "We *Must* Do It," and also on the leaderette on "The Commercial Man." We *can* do it, and we *will* do it if the necessary support is forthcoming. Once we get the body of men together we shall soon find the man to lead.

In the leaderette you ask, "Which of them should we look to at this moment to call a big meeting, where, say, the question 'Would a tariff help the electrical industry?' could be thoroughly discussed?"

An association comprised of financial men, accountants, salesmen, etc., would, I think, be the body to thoroughly explore this question. They could also devote the time and discuss the question of tariffs in general. I am not confusing this with tariff reform to which you evidently refer, but with rates of charging for electricity supply, as local conditions have a considerable bearing on this important matter. This, together with local propaganda, are only two of the very many items which could be discussed.

When I refer to local work it does not mean that this should be parochial, but I would like to see area committees formed, and the pros and cons of any particular case discussed.

In your issue of March 6th, 1931, an article appeared "Marketing the Goods: The growing importance of the commercial side of the electrical industry," to which I would refer your readers.

In conclusion, I sincerely trust that your advocacy of this cause will arouse the commercial man out of his apparent apathy, or attitude of *laissez faire*.

November 13th, 1931. PROTECTION.

I am pleased to see the interest that has been aroused upon this important question, also the proposal to form a Commercial Electrical Association. There is plenty of scope for this proposed body, without overlapping with any of the existing associations, and the suggestions of "Protection" in your issue of November 13th are worthy of further consideration.

I believe that some years ago such an association was in existence, in fact, I believe it was represented on a panel of the National Joint Board, or a proposed panel was formed which was subsequently dropped. Opposition to the proposed association will no doubt have to be met, as there undoubtedly exists a certain amount of jealousy between the technical and the commercial staffs, which should not be, as we are all working for the common cause, and the formation of a Commercial Electrical Association would do a great deal to remove this petty jealousy.

November 14th, 1931. UNIT.

About a year since, in a communication to the chairman of the E.D.A., I outlined my ideas as to the organisation of that Association. I advocated, amongst other things, that a body of young technical men should be recruited by them for canvassing, to be lent to supply authorities on the basis of cost, and in this way commence a systematic canvass of localities.

The scheme is clearly one for an Association to organise. A few men and women got together for one locality would not work with much enthusiasm if their job were to terminate at the end of a few weeks. A group of twelve or more specially selected and coached in the duties involved, should be worthy of continuous employment, by way of transfer and in rotation to districts joining in the plan of campaign. A card index of every call would be left behind for further attention by the local authority, as circumstances permitted.

A part of the organisation of such a canvass might be a local exhibition or special showroom effort.

I agree that most authorities have now excellent showrooms and first-class assistants, able and willing to render every help if called upon, and that in some districts there are regular canvassers. But generally, speaking from my own experience of about twenty-five years, and connection with undertakings in London and elsewhere using a fairly large amount of electricity, I have no recollection of a canvasser calling from the supply authority on his own account to inquire whether my firm were satisfied consumers, or that any addition, advice or help might be used to advantage.

On the other hand, in the course of business calls it is a common occurrence to walk into innumerable places with effete lighting and wasteful power lay-outs, where there is ample scope for someone to try, at any rate, to interest those responsible in the utility and economy of modern lighting, heating and power.

Croydon, *November 16th*, 1931. E. C. SEEAR.

With reference to your editorial, might I draw attention to the poor example set by the Electric Supply Department of the City of Birmingham.

Thousands of Corporation houses have been built, and thousands more are to be erected, but in none is provision made for a power circuit.

Such is the situation in one of the largest cities in the British Isles, a city whose motto is "Forward!"

EDWARD W. ORGAN.

Birmingham, *November 14th*, 1931.

Still the Boiling Plate

I have read Mr. Blair's query in your issue of November 13th regarding the combination of gas and electricity in cookers, and, whilst this is certainly of some interest at the moment, due to the respective advantages of the electric oven and the gas ring, it seems tenable only so long as the boiling plate remains in its present state of imperfection. There is, however, no reason why it should so remain, as, in spite of the fact that the gas ring sets a good standard, due to certain natural proclivities, it will always possess certain disadvantages, although these are by no means so pronounced as in the case of the oven.

Properly tackled by modern research methods, however, the boiling plate is capable of considerable improvement in the direction of speed, and the problem of control is by no means insurmountable, although, as indicated by Mr. Best in your issue of October 30th, this matter has probably now proceeded as far as it can in the present rut. In other words, the problem is partly economic, but the writer believes that, tackled properly, the technical difficulties can be solved and that, if a much-improved pattern were produced, it would be readily accepted.

It will be necessary, however, to overhaul methods of manufacture besides design, but there is no difficulty in this, as, after all, these lines are distinctly of the repetition variety, the material easy to work and reasonable in price, and the labour not necessarily highly skilled—all factors which with proper handling can be used to offset the economic problem. Undoubtedly some such improvements are needed if electric cooking is really to come into its own, but fortunately there is no reason to consider their accomplishment either unreasonably difficult or expensive.

Huddersfield, *November 15th*, 1931. CHARLES E. BAXTER.

The Electric Drive in Factories

In checking the copy of my letter, dated November 5th, in your current issue, I notice that in the third paragraph an error on my part has crept in.

The last line should read, "somewhere between 0.40 and 0.45 lb. per b.h.p. per hour." This is, of course, a very important point.

R. H. GREEN.
Engine Sales Manager, Petters, Ltd.

Yeovil, *November 13th*, 1931.

Electric Clocks

Speculation upon the ultimate future of time-keeping for the whole nation is interesting. It is a pastime I began in 1895.

We may imagine the alternating generators of all public supply authorities being "tied" to the "Synchronome" free pendulum at Greenwich Observatory, so that all and every time-keeping job may be accomplished by a.c. synchronous motors—from the mantelshelf clock to Big Ben—from recording measuring instruments to employés' registers and street-lighting time switches—for everything, in fact, except watches and ships' clocks. The next generation may see our grandfather clocks banished to the remote corners of our isle where gas and candles may still be found.

But the time is not yet, except for domestic use in selected areas. Circuits of electrical impulse dials are still by far the best means of providing a reliable service of uniform and

accurate time in large buildings, even where alternating current of the standard periodicity and voltage is available, with 100 per cent. continuity assured.

In the meantime, I would deplore the indiscriminate issue of motor clocks by those whose only motive is to make something to sell. The reputation of electric clocks, which it has taken the best part of a lifetime to restore, will be again destroyed. Motor clocks, carelessly supplied and used, will cut at the root of those ideals of service of which electrical impulse dials are such a fine expression.

And how will the Daylight Saving changes be effected in large buildings?

F. HOPE-JONES, M.I.E.E., F.R.A.S.

London, E,C.1, *November 10th*, 1931.

Messrs. Everett, Edgcumbe & Co., Ltd., in the letter which was printed in your issue of November 6th have, it seems to me, used a totally fallacious argument in developing their comparison between the merits of high-speed and low-speed motors for clockwork.

Their main argument is that with the high-speed motor the torque is so small that the oil film between the gears is never penetrated, and that in consequence no wear of these parts takes place. While I do not wish to dispute this contention, I would like to point out that in the low-speed motor these parts do not exist *at all*, and that the torque at the low-speed wheels of the train, which are common to both clocks, will, of course, be equal, being determined not by the characteristics of the motor, but by those of the mechanism which it has to drive. Even, therefore, if Messrs. Everett, Edgcumbe can produce their high-speed gears absolutely trouble free and with indefinite life, the two systems can only attain parity in this respect, while the high-speed motor must in consequence of its higher speed always give noisier operation than its competitor.

A further point must, of course, be obvious, namely, that the high-speed motor, with its additional fast-running pinion and losses due to viscosity of the lubricating oil must in general consume rather more energy than its competitor, and it is, I believe, a fact that the high-speed motor in general takes from 2.5 W, while from 1 to 1.5 W suffices for a clock of the low-speed type.

As regards the self-starting characteristics of the high-speed motor, if these necessitate the introduction of an additional indicating device (itself a potential source of noise) in order to draw the user's attention to an interruption of the supply, it seems to me that the advantages of these characteristics must surely be somewhat open to question.

E. A. WATSON.

Coventry, *November 13th*, 1931.

In a letter signed " K. H." in your issue of November 6th, it is stated that battery-impulse clocks are out of date. We suggest that this statement is quite inaccurate, as such clocks do not give considerable trouble if properly made and properly installed, as has been proved over a long period of years.

The synchronous motor clock may serve for private houses and where a few clocks are required, but for larger installations the master clock controlled impulse system is still the best and most reliable, besides being easy to alter from summer to winter time and vice versa.

As we market both systems we are in a position to know the faults and advantages of both.

MAGNETA TIME CO., LTD.

London, S.W.1, *November 13th*, 1931.

In describing a new electrically operated clock on p. 743 of your issue of November 13th, you say that " it is estimated that the clock should run for probably fifty years without being incorrect to more than a second or two."

This statement is misleading, as, of course, no such accuracy would obtain. The accuracy of the clock entirely depends on the vigilance of the controlling engineer at the power station.

I have noticed that using a mains-operated clock, even on a controlled frequency, an error of as much as 20 seconds fast or slow has occurred within 12 hours.

H. K. PARSONS.

Leicester, *November 14th*, 1931.

Your correspondent " K.H." appears to have overlooked the fact that modern systems of electric impulse clocks are now almost always operated by current from the a.c. mains. By the method adopted any temporary failure of the supply (from any cause) does not affect the clocks. Actual experience has shown that the supply may be off for several weeks without stopping the system. Also the supply may be designedly cut off from the building at night.

The method of operation which has been introduced by Messrs. Gent & Co., Ltd., consists of a trickle charging unit specially designed for the purpose and permanently connected to the mains and by means of which a small sealed accumulator is kept at full voltage by trickle charging at a current of a few milliampères only. By this system periodical charging and attention is dispensed with, the action being entirely automatic, and the current consumption negligible.

It may surprise many to learn that a modern efficient impulse clock system consumes only 0.5 Ah per month. Many installations previously operated by primary batteries have been fitted with this modern method of operation.

ALFRED E. BALL, F.B.H.I.

Leicester, *November 16th*, 1931.

Time Switches

We are reminded by the notice of a foreign time switch in your issue of November 13th that it has been a feature of several such notices recently to claim novelty for ability to omit Sunday switching if required. This, of course, is a very old feature in time switches, and any desired selection can be given, either for the switch to remain " in " or " out " on one or more days, or for later or earlier-hour switching on any desired days.

Another point perhaps worth mentioning is that foreigners always speak of " astronomical " when they are referring to an automatic daily change to follow the rising and setting of the sun. We think " solar " is the correct word, and it is certainly shorter.

For *Venner Time Switches, Ltd.*,
ERNEST E. SHARP, *Director.*

New Malden, Surrey, *November 13th*, 1931.

Power Station Men and Distribution

I read with interest in the ELECTRICAL REVIEW of November 6th, under the above heading, the remarks of Mr. W. N. C. Clinch, engineer and manager at Brighton, at a recent E.P.E.A. dinner.

He said that the National Grid Scheme would involve unemployment for station engineers due to the shutting down of the smaller-capacity power stations, when they would possibly be given mains appointments.

At present the majority of chiefs and chief mains engineers will not adapt themselves to the employment of station engineers as distribution men. There is also the difficulty of a lot of the station engineers who have spent so many years with the power station " hum " adapting themselves to distribution appointments.

Might I suggest that a way to make more power station appointments would be to institute six-hour shifts, with the usual spare engineer in stations of over 50,000-kW capacity, instead of the present eight-hour shifts? A six-hour shift under normal running in a power station of 260,000-kW capacity is ample for any man, especially when he has emergencies to handle. The same six-hour shifts might be applied to the control engineers and the higher grades of the men. Also night mains engineers might be employed to create more mains appointments and relieve the present mains engineers of the twenty-four-hour strain.

The adoption of the above extra employment would not add very much to the salary charges, and possibly there would not be so many good careers thrown to the winds.

G. E. WALKER.

Chester, *November 10th*, 1931.

Testimonials from Employers

I fully agree with the remarks of " Similarly Affected " in your issue of November 6th. Unfortunately, there is no remedy, as certain employers are adamant in refusing to write and hand over a testimonial personally to an employé, no matter of what standing; although from my own experience such an employer would demand one for himself and with all adornments.

The various associations, trade unions, and like societies, have ever been sadly wanting in trying to amend such a rule, which has often retarded the advancement of many an honest man or woman.

FORMERLY AFFECTED.

November 10th, 1931.

Efficient Purchasing

From inquiries which we have received it appears that an impression exists that this Association will conduct purchasing operations on behalf of its members. We take the earliest opportunity of stating that this is not so, and that the Association exists to promote efficiency in purchasing while still leaving individual firms to do their own.

When the Association speaks of centralised purchasing it means centralisation in the individual firm and not centralisation in reference to industry as a whole. We shall much appreciate your courtesy in allowing us to make this clear to your readers.

STANLEY TOWNSEND.
Hon. Secretary,
British Industrial Purchasing Officers' Association.

London, S.W.1, *November 16th*, 1931.

New L.N.E.R. Works

Modern electrical machinery will be installed in the new workshops which are being built for the London and North-Eastern Railway Co. at Darlington. The shops, which are being erected on a site south of Darlington Bank Top Station, are to take the place of the present buildings and workshops of the Engineer's Department in Whessoe Lane.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Easy-wiring Switch

All of us who have had trouble in connecting up tumbler switches owing to the difficulty of manipulating the wires at the back will be interested in the new "G.E.C.-Deeble" slotted-base switch. Externally it resembles the ordinary surface type, but differs internally in having enough space below the mechanism to allow the wires to be drawn through a slotted hole after the switch has been fixed to its block. It only remains to cut off the wire to the required length and connect to the terminals, which are arranged for front-wiring. This arrangement of the terminals should protect them from moisture, while the deep channels at either side of the movement keep the insulated wire from coming into contact with any metal parts, either of the cover or the mechanism. The movement of the switch has the same positive link action as is found in the "slick" pattern. The base is of vitreous porcelain and the contacts are of the double-leaf embracing type. The metal covers are of heavy-gauge spun brass and special finishes can be supplied. Alternatively "Bakelite" covers in a range of colours are available. This new design has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.

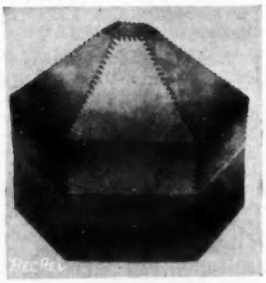
An easy wiring switch

Coil-taping Machines

MR. FRANK WHITELEGG, 35, Union Road, S.E.16, has recently introduced in this country machines suitable for wrapping coils, rings, strips, tubes, etc., of very varied sections, with paper, cotton or silk tape, and also with wire. It will deal with coils of from ¾-in. to 40-in. inside diameter, and up to 4-in. section. Automatic feed ensures high output, while adjustable feed by gears varies the overlap. Strip can be cut automatically in predetermined lengths.

An Imitation Vellum Shade

The 14-in. pendant "Electa Universal" lampshade introduced recently by ELECTRIC ART SHADES (1928), LTD., Kelvedon, Essex, is designed for dining room, hall or bedroom use, and is made of imitation vellum with a delicately shaded 4-in. silk fringe. It is hand-tinted in a neutral shaded brown, so that it will harmonise with various furnishing schemes. A 12-in. reversible gimbal fitting for a table lamp or pendant and a 20-in. duplex fitting for a floor standard are also supplied in imitation vellum, while the three sizes are also available in "Electa Marbleoid," a washable, non-inflammable and fadeless material very suitable for illumination purposes.



"Electa Universal" lampshade

Novel Resistance Units

The WEGO CONDENSER CO., LTD., 58, Spencer Street, E.C.1, has just placed on the English market a range of "Silko" resistance units of novel construction. The actual fine "constantan" resistance wire forms the weight of the texture of ribbon with artificial silk warps. The ribbon is made up in widths of 4, 6, 8 and 23 cm., and carries marking threads of different colours corresponding to the diameter of the wire. The resistance units are constructed in cartridge form, and the ends of the wire are sweated to suitable end-cap terminals, the actual resistance value depending, of course, on the length of the ribbon, which is rolled up with insulating paper. Units are available with resistance values of from 100 to 500,000 ohms.

A Tubular Heater

The "Stella" tubular heater recently introduced by the STELLA CONDUIT CO., LTD., 16, Beeches Road, West Bromwich, is claimed to be unique in that the heating elements are mounted in a chassis consisting of parallel rigid conductors with strips of mica threaded over the conductors and suitably spaced by means of porcelains. By this method the resistance wire is supported in slotted micas, so that the element cannot become displaced or sag, and make contact with the outer steel tube. The whole of the element and chassis is of robust design, and also sufficiently flexible for it to be mounted in curved tubes. The surface temperature of the heater varies from 180 to 200 deg. F., and it has been found that the mean air temperature 6 in. above a tube, loaded to 60 W per foot, is approximately 60 deg. F. The terminal assembly is very simple and accessible, with a complete absence of small parts. The substantial terminals provide two methods of connection, and the earth terminal is conveniently placed with ample clearance. The end protecting cap is retained in position by one nut and is easily removable. Another feature of the apparatus is the neat and unobtrusive brackets. These are mild steel pressings, and the screws are sherardised. Brackets are supplied for 1-, 2-, 3- and 4-way mounting, and they are simple but very strong and rigid.

Prismatic Lighting Fitting

The "Simplex" prismatic lighting unit recently introduced by SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham, is a light, small, and efficient fitting which should prove very useful where space is limited and neatness is desirable. It is weatherproof, the outside being finished in bright silver "Gallulose," and the inside in white porcelain enamel. The ¾-in. sealed "knockouts" provided at both ends and the removable lampholder bracket (with a porcelain b.c. holder and adjustable focusing for a 40 or 60 W gasfilled lamp) make wiring quick and easy. A "Simplex" turnbuckle fastening, in conjunction with the special locking lug, allows the fittings to be secured by a small padlock. The body is of pressed steel with cast end plates, and a substantial hinged cover.

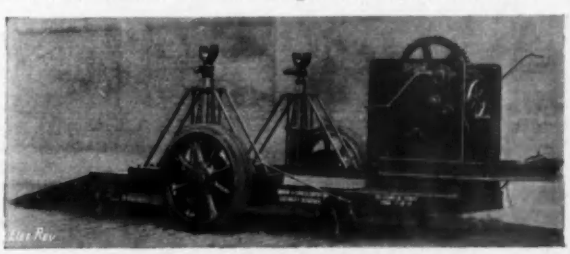
"Simplex" prismatic lighting unit

Fire-fighting Equipment

A recent adaptation of the "Essex" fire extinguisher used by the Royal Air Force is the "Featherspray" apparatus employing methyl bromide, a medium which is claimed to be approximately four times as powerful as carbon tetrachloride, equivalent to foam in the proportion of 20 oz. to two gallons, and safe for use on high voltages. The extinguishing unit is carried in a bracket fitted with a manually or automatically operated puncturing device, and can be removed therefrom and used independently as a hand extinguisher. While in the bracket, however, it connects with a series of small copper tubes terminating in sprayheads of suitable design. The small tubes have generally an internal diameter of ¼ in., are very easy to fit, and are inconspicuous when installed on transformer tanks and in similar positions where the fire hazard is considered sufficient to merit permanent protection. The makers are the NATIONAL FIRE PROTECTION CO., LTD., Petersham Road, Richmond.

Cable-drum Wagon

A two-wheel trailer capable of carrying cable drums up to a total weight of 6 tons has recently been constructed by R. A. DYSON & CO., LTD., Grafton Street, Liverpool, for the Barrow-in-Furness electricity undertaking. The drum is mounted on a pair of ratchet-type lifting jacks, which enable it to be raised and so permit the cable to be paid out without removing the drum from the trailer. The jacks are set slightly to the rear of the axle, this resulting in the trailer, when loaded, being more or less balanced. The chassis is built of steel channels with steel plates electrically welded in at the points of maximum bending moment. It is mounted on a cranked axle and runs on cast-steel rubber-tyred wheels. A double-purchase crab-pattern winch with a screw-operated band brake and safety pawl hauls the loaded drum into position up the tailboard. The loading platform has an area of 9 ft. × 5 ft., and the height of the floor boards above the ground is approximately 14 in. To steady the trailer when paying out cable, short jacks are fitted to each corner. These jacks are hinged so that they can be permanently attached and turned up out of the way when the trailer is travelling. Since the photograph which we reproduce was taken, a screw-operated, rubber-tyred caster wheel has been fitted to the front end of the trailer. The tare weight of the latter is 28 cwt.



A two-wheel trailer for cable drums

New Books

Television—To-Day and To-Morrow. By SYDNEY A. MOSELEY and H. J. BARTON CHAPPLE. Second edition: Pp. xxvii+159; illustrated. London: Sir Isaac Pitman & Son, Ltd. Price 7s. 6d. net.

This book might now more accurately be described as television yesterday and to-day, for it gives a good account of the earlier history of television experiments, with a recital of claims to priority, but no very precise indication of their reduction to an eminently practical working basis.

The first edition of this book was reviewed in detail in our issue of May 23rd, 1930, and this, the second edition, has been revised and enlarged with advantage. The book is based upon and practically limited to the work of Baird, and is for the most part lucidly written in a descriptive style. The illustrations are good, well chosen, and give a very fair idea of the progress made by Baird to date, and of the results now obtainable under present working conditions; while the diagrams are numerous, varied and clear, as well as more detailed than in the former edition.

The chapter dealing with television in other countries is very far from comprehensive or up to date, and the authors would appear to be unaware that what they call the new "big screen" is at least similar to the multi-bank of lamps used formerly by experimenters in America, with its concomitant complication of contacts.

Fuller treatment of photo-electric cells and some working data are now given; also the details of suitable arrangements in wireless receivers for television, are extended and improved. To constructors and users of the Baird receiver the book will be valuable by reason of the technical data and practical instructions which are given in fair detail.

Fundamentals of Electricity and Magnetism. By LEONARD B. LOEB, Professor of Physics, University of California. Pp. xx+432; figs. 187. London: Chapman & Hall, Ltd. Price 20s.

This is really matter "crowded out" of a two-year course conducted by the author on the subject of the title.

Fundamental work concerning such subjects as units, the electric circuit, and the magnetic circuit are covered in a detailed and accurate manner. In particular, the importance and utility of Kirchhoff's Laws are stressed and rules given for their systematic application to network problems. The author is to be commended on the careful and detailed way in which the calculus is applied as opportunities offer, particularly in the section on a.c. work.

The book is well suited to the needs of full-time students of electrical engineering, and, though some little inconvenience will be caused to British readers by the use of American methods in spelling and other matters, it may be recommended as a sound and reliable work.

Selbstkostenrechnung eines Werkes der Kupferhalbzeugindustrie. By Dr. Ing. Walter Moeller. Pp. viii+132, with 4 illustrations and 35 tables. Berlin: V.D.I. Verlag. Price Rm. 10 (10s.).

In the book before us, which is printed in German, the author surveys the methods nowadays applied to determine the costs in a copper works manufacturing semi-finished materials, their suitability and applicability to various service conditions being investigated.

The work is divided into three sections. The first gives particulars of the manufacturing processes by which the various materials are produced.

The second part deals with the different cost elements and their places of origin, material, labour, and special costs being considered in detail. Typical examples taken from copper refining and rolling plants demonstrate how the cost elements are allocated to the accounts of the individual departments and a chart is included showing graphically the inter-connection of the various departmental accounts and indicating how the allocation of the commercial and factory overhead charges were dealt with.

The third part deals with the unit cost of production as the products pass through the manufacturing departments, the overhead charges being distributed accordingly.

The last chapters of the book are devoted to the question of short-period balance sheets and to the relations between volume of business, price-policy, and costs.

Electrical Laboratory Studies. By W. L. UPSON. Pp. x+182; figs. 60. London: McGraw-Hill Publishing Co., Ltd. Price 10s. net.

The author of this book does not seem to have been quite sure of his aim. A considerable proportion of the book consists of ordinary text-book theory, and interspersed with this there are laboratory experiments, experimental studies, problems, and questions.

The field covered is that of the d.c. electric circuit, heat, electro-magnets and d.c. machines, and the book concludes with a short chapter containing five a.c. circuit experiments. There are no electro-chemical or electrostatic experiments, nothing on electromagnetic induction, and no permeability or other iron tests. Apart from these very serious gaps, there are a number of cases in which the experiments actually included could have been broadened so as to illustrate the underlying principles. Thus an experiment on the testing of fuses deals with different overloads on a given fuse wire, but there is no suggestion of trying the effect of varying either the diameter, the material, or the length of the wire. As an example of what might well have been omitted from a book intended for general use there are a picture and description occupying several pages of an experiment to determine the effectiveness of storm windows. One or two experiments on induction or electrolysis would surely have been more serviceable to students.

A collection of experiment sheets built up round a particular collection of apparatus at a particular institution will need very careful sifting if they are to be of service outside. "Having gotten so far," as the author puts it, it is only necessary to add that the production and publication work is good, whilst the style is definitely not.

Mathematics for Self Study. By J. E. THOMPSON, B.S., M.A. Four volumes: Arithmetic, Algebra, Trigonometry and Calculus. London: George Routledge and Sons, Ltd. Price 7s. 6d. each volume.

These four volumes throw a valuable light on modern methods of education in America. The author has attempted to state the fundamental principles of mathematical science in such a manner that they will be clearly understood by the practical man studying without the aid of a teacher.

The first volume is devoted to arithmetic, the elementary principles being well stated, followed by methods, measurements and some special applications. The practical value of this volume is best shown in the chapter which deals with methods of presenting statistical data, and their applications, together with methods of determining compound interest by simple percentages, and by the use of logarithms. The second volume may be considered as an introduction to the symbolic language of algebra, and deals with the fundamental methods and formulation of principles, together with the meaning of equations and an explanation of the principles of logarithms.

The third volume is devoted to a simplified treatment of trigonometry, the subject being considered as a practical and numerical application of algebraic rules, including calculations of the dimensions and properties of plane figures and a consideration of the relations which exist between the trigonometrical functions. The fourth volume is a simplified study and exposition of the calculus, applying the method of rates and not that of limits. The volume is well planned, the subject is presented in an informal manner.

The series of questions and answers which appear at the end of each chapter throughout the four volumes is a useful feature, the text has been written with care, and the volumes can be recommended for the specific purpose of the title.

Polyphase Induction Motors. By LOUIS LAGRON. Translated from the French by R. C. Simpson and M. G. Say. Pp. xiv.+218; figs. 132. London: Blackie & Son. Price 15s. net.

This book follows closely the famous work by Prof. E. Arnold and will on that account appeal to those who use his methods. The author does not strike out on any new lines (in spite of the claim of "freshness of outlook and novelty of treatment" on the dust-cover), but the treatment is by no means superficial. The book should appeal to the mathematically minded, but it will probably be beyond most beginners.

The method used for calculating the magnetising current is rather laborious, following slavishly the one in Arnold's "Wechselstromtechnik." This might well have been discarded for almost any of the modern alternatives, such as the 60-degree density method. Among the losses it is pleasing to find here, as in Arnold, an attempt to formulate the tooth pulsation losses, which can assume considerable importance in practical machines. The chapter on heating is rather theoretical, and little attempt is made to apply the results. The long discussion of the current diagram contains much useful information, but some of the refinements are too laboured for the non-specialist. The chapter on testing is somewhat meagre, and might prove inadequate for practical needs. It is something of a surprise, in this year of grace, to find descriptions of the Boucherot "Alpha" and "Beta" motors, with the double-cage or "Gamma" motor dismissed rather cursorily. The curve of effective torque for this motor is given on an assumption of zero starter resistance, and scarcely conveys the correct impression of its capabilities. The sections in the original work relating to single-phase induction and a.c. commutator motors have been omitted in the translation. A good index and a complete list of symbols are given, and references to French standards of construction, etc., have been replaced by the appropriate British equivalents.

* * *

Shorter Notices

"Welding Structures," by V. A. Prince. Published by The Draughtsman Publishing Co., Ltd., for the Association of Engineering and Shipbuilding Draughtsmen. Price 2s. net.

"Les Machines à Courants Continue," by M. R. Langlois-Berthelot. Pp. xiv+289. Paris: Gauthier-Villars & Cie., 55 Quai des Grands-Augustins. Price 75 francs.

British Electrical Trade in October

THE table below summarises our electrical exports and imports during October. An analysis of the electrical machinery exports shows an increase of £73,131 compared with September, the total value of the goods amounting to £460,219. This figure is, however, £107,522 lower than that for October, 1930. The total quantity of the exports in tons was 3,008, as against 2,588 in September and 3,741 in October, 1930. With the exception of exports under the classification of "other countries" (£133,930 against £72,561 in October, 1930), there was a decided decline in goods purchased by every country compared with October, 1930. Shipments to Australia fell from £62,157 to £2,945, while South America's purchases amounted to £21,056 as against £78,075. Other outstanding decreases were: South Africa, from £39,165 to £27,437; Japan, from £7,940 to £919; India, from £79,542 to £68,117; and New Zealand, from £26,052 to £19,120. Compared with September, figures generally show improvement, exports to Canada in particular advancing from £8,190 to £45,653.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Oct., 1931.	Inc. or dec. as compared with Sept., 1931.	Inc. or dec. as compared with Oct., 1930.	Electrical imports for Oct., 1931.	Inc. or dec. as compared with Sept., 1931.	Inc. or dec. as compared with Oct., 1930.	Electrical re-exports for Oct., 1931.	Inc. or dec. as compared with Sept., 1931.	Inc. or dec. as compared with Oct., 1930.
Electrical goods and apparatus (unenumerated)	£165,863	+ £31,005	− £72,050	£209,886	+ £50,443	+ £39,275	£8,463	+£4,140	− £334
Insulated cables and wires	130,221	+ 31,544	− 70,934	83,602	+ 25,424	+ 946	1,239	+ 985	+ 675
Glow lamps	27,085	+ 2,637	− 13,680	60,002	+ 13,871	− 5,443	786	− 39	− 15
Arc lamps and parts	364	+ 113	− 1,598	5,500	+ 2,922	− 37	13	− 238	− 127
Batteries and accumulators	81,160	+ 18,611	+ 11,613	78,645	− 18,034	− 50,374	694	− 144	+ 176
Meters and instruments	28,758	+ 8,531	− 14,271	40,015	+ 9,283	− 35,536	499	+ 69	− 9,818
Carbons	1,935	− 543	+ 1,404	24,485	− 8,561	+ 9,319	87	+ 36	+ 15
Switchboards (not telegraph or telephone)	2,555	+ 1,354	− 10,954	15	− 140	− 45	101	+ 81	+ 101
Electrical Machinery—									
Electrical machinery (unenumerated)	261,070	+ 45,753	− 87,073	227,588	+ 110,341	+ 68,355	9,158	− 920	− 701
Railway and tramway motors	1,497	+ 497	− 7,635	—	—	—	—	—	—
Other motors and generators	197,652	+ 26,881	− 12,814	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	17,877	− 68	− 43,872	4,066	+ 2,562	+ 2,732	2	+ 2	+ 2
Submarine telegraph and telephone cable	4,111	+ 3,122	− 51,031	—	—	—	—	—	—
Telegraph and telephone apparatus	157,228	+ 39,117	− 99,007	303,057	+ 143,142	+ 113,792	5,979	+ 1,663	− 2,571
Total	£1,077,376	+£208,554	−£471,902	£1,036,861	+£331,253	+£142,984	£27,021	+£5,635	−£12,597
Decreases for the first ten months of the year		Exports. £5,437,940			Imports. £1,297,946			Re-Exports. £250,645	

Electricity Production in Italy

SIGNOR Ing. Ettore Cesari, director of the Unione Nazionale Fascista Industrie Elettriche, has sent us a reprint of an article which he contributed to a recent issue of *L'Energia Elettrica*, in which he deals very exhaustively with the progress of electric power supply in Italy during 1930. The article, which is accompanied by numerous statistical tables, shows that there are now 1,215 private electricity supply undertakings in the country of which the "Unfiel" (a name derived from the initial letters of that of the Union) has statistics, and that invested capital amounts to over 117 millions sterling. The number of electricity supply undertakings in the country from which Unfiel obtains monthly output returns increased during the year from 322 to 391, of which 215 company and 40 municipal undertakings give public supplies.

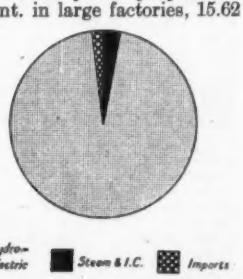
Class of Plant.	1931. kWh.	1930. kWh.
Hydro-electric plant	9,885,533,091	9,500,934,897
Steam and internal combustion engine stations	303,475,195	424,913,581
Totals	10,189,008,286	9,925,848,478

Table showing the predominance of hydro-electric plant

Owing to the worldwide industrial depression there was an increase of only 2.65 per cent. in the output of electric power in Italy, a total of roundly 10,189 million kWh being reached in 1930 as compared with 9,925 million kWh in the preceding year. The table above shows the outputs of the different classes of power stations, the totals including power "imported" from Switzerland, which fell, however, from 243.75 million kWh in 1929 to 164 million kWh last year.

Of the country's electricity consumption, it is estimated that 7.92 per cent. is used for house, office, and warehouse lighting and other purposes 1.83 per cent. for factory, theatre and picture palace lighting; 25.1 per cent. for power purposes in small and medium works, 19 per cent. in large factories, 15.62 per cent. by concerns generating their own power, 1.34 per cent. for agricultural purposes, 10 per cent. for tramway and railway operation, and 16.46 per cent. for miscellaneous purposes.

The chief development in Italy is in connection with hydro-electric plant, as the capacity of steam and internal-combustion-engined installations only increased by 18,000 kW in 1930 and now amounts to roundly 840,000 kW, as against only 400,000 kW ten years ago. Altogether the Union has statistics of 204 stations; the majority are however of small capacity, there being only six large steam-operated stations in the country, *viz.*, at Genoa, Leghorn, Naples, Piacenza, Turbigo, and Venice, which have a present combined installed capacity of 234,600 kW, which is to be eventually increased to 681,000 kW. An interesting item in connection with the steam-operated power stations is that fifteen (of a total of 89,221 kW) are operated by Italian coal, and were responsible for an output of 87,258,660 kWh during 1930.

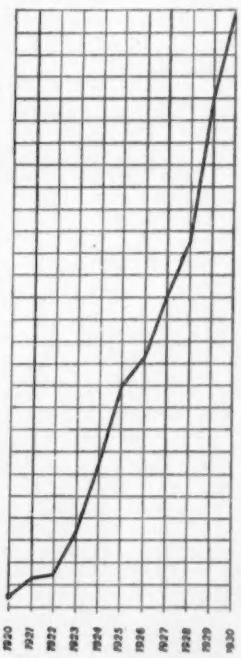


Italian electric power consumption in 1930

The hydro-electric generating plant of which the Union has details advanced in number from 794 to 804 and in installed capacity from 3,129,566 to 3,507,543 kW, of which 2,618,635 kW is in Northern Italy. It is estimated, however, that the total installed capacity actually reaches 3,800,000 kW, as compared with only about 1,250,000 kW at the end of 1920, the year when records first began to be kept.

During the year only 66 applications for important hydro-electric concessions, representing a total of 466,107 h.p., were received by the Government, as compared with 89 and 809,650 h.p., respectively, in 1929. The power aggregate of all the concessions granted up to the end of last year amounted to 6,048,470 h.p., of which only about half is so far being actually utilised. At the close of the year thirteen additional hydro-electric power stations of an aggregate capacity of 303,770 kW were in course of construction and, when completed, these are expected to give an additional annual output of roundly 951 million kWh.

Considerable progress was made during 1930 in the erection of high-voltage power transmission lines and at the end of the year it was estimated that no fewer than 55,520 miles of such lines were in commission in the country, of which 3,351 miles operate at over 120,000 V., 6,694 miles at between 50,000 and 90,000 V., 11,225 miles at between 20,000 and 49,000 V, and 31,250 miles at under 20,000 V.



Hydro-electric development (in millions of kW) 1920-1930

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Canvassing the Country

Among those who are doing excellent work just now in spreading the good news of domestic electricity throughout the country, we have to reckon Messrs. Johnson & Phillips, Ltd., of Charlton, for during the past six weeks they have circulated many thousands of copies of their excellent pamphlet, "How to Have Your House Wired." This beautifully got-up pamphlet is illustrated in colour showing the charming effects that may be obtained in every part of a household when electricity is given a chance. The booklet is intended for distribution to the general public through wiring contractors, and the latter will do well to write for a bundle of copies when they undertake a local canvass on their own.

A Check to Dumping

A Bill giving the Board of Trade power to impose duties up to 100 per cent. on any goods under Class 3 of the import classification (which covers manufactured and mainly manufactured goods) was introduced into the House of Commons on Tuesday, and is expected to receive the Royal Assent by the end of this week. The Bill is to be limited in its operation to six months, and is quite independent of the Government's general tariff policy, being directed solely to closing the gap between exports and imports.

Announcing the Government's decision to check imports, Mr. W. Runciman, President of the Board of Trade, said in the House of Commons on Monday that the imports in Class 3 were £28,000,000 two years ago, but during the ten days of November just passed they had run up to the rate of £35,000,000. There were in the list of articles increases to the extent of 80, 90, and 100 per cent. Mr. Runciman added that, as each Order had to receive the sanction of the House, the Commons would be able to exercise control, and the emergency powers would expire in six months.

Elektrolux in England

M. Erik Wenander, of the Elektrolux combine, who is a member of the board of the subsidiary company Aktiebolaget Arctic of Motala, which manufactures refrigerators, was interviewed by *Nya Dagligt Allehanda* on his return from London recently. M. Wenander said that if a protectionist policy were introduced in Great Britain it would be necessary considerably to enlarge the British works of the Elektrolux combine, as it would no longer be possible to bring over half-manufactured goods for the works from Sweden.—*Reuter's Trade Service* (Stockholm).

Scottish National Radio Exhibition

The second Scottish National Radio Exhibition was opened in the Waverley Market, Edinburgh, on November 11th, and in addition to the support of the radio trade in Scotland it has this year the recognition of the Radio Manufacturers' Association. There are over 100 stands, compared with forty-two last year. The opening ceremony was performed by Sir Gordon Nairne, Bt., one of the governors of the B.B.C.

Waste in Industry

At a conference held by the Industrial Welfare Society on November 13th at the Hotel Metropole, S.W., the planning of works and factory economy was discussed. Mr. E. S. Byng, managing director of Standard Telephones & Cables, Ltd., in an address on "Waste of Material," said that this was a matter which had received too little attention in this country. It was their duty to reduce waste in industry to a minimum, and he suggested economy in such items as heating, lighting, postage and stationery.

Hints to Commercial Visitors

A further addition to the "Hints to Commercial Visitors" booklets, published by the Department of Overseas Trade (Ref. No. C.3694) relates to French Indo-China. In addition to the usual particulars regarding travelling facilities, reference is made to import duties, cable rates, and the telephone service. A similar publication relating to Newfoundland (Ref. C.3716) has also been published.

Trade Depression in the United States

There does not appear to be any indication as yet of a break in the continued decline in sales of electrical goods produced in the United States, according to statistics published in the October issue of the "Survey" of the National Electrical Manufacturers' Association (U.S.A.). Figures comparing the output of members of the Association during August and July with that of the corresponding period of last year indicate a decided decrease in practically every case. For the two months mentioned reports were received by the Association from various members showing that orders for a.c. motors (1/200 h.p.) with control equipment totalled only $3,152,872, a decline of 37 per cent. as compared with last year's figure ($4,970,617); similarly orders for d.c. motors fell from $1,397,193 to $676,210. Fractional h.p. motors at $3,202,826 were less seriously affected, being only $550,047, or 14 per cent., lower. Large decreases were recorded in power switching equipment, indoor apparatus falling from $159,272 to $91,229 and outdoor apparatus from $770,718 to $535,954. The market for electric furnaces also remained slack, the value of orders for this class of apparatus declining from $535,815 to $244,986.

Domestic Electrical Appliances in Venezuela

The following is an extract from a private letter just received from Valencia, Venezuela, by one of our contributors. "The local electricity supply company is doing well and is extending its plant in order to cope with the growing consumption. There are a large number of new houses being built and all are using electricity. Also a good number of electric stoves and refrigerators are being introduced into the country and everyone is buying them." It would appear that the South American Republic is worthy of the attention of British manufacturers.

B.T.H. Magnetos in Air Records

In her record flight from England to the Cape Miss Salaman used a "Puss-Moth" aeroplane, the engine of which was fitted with two B.T.H. standard type AG.44 magnetos. The Comper-Swift aeroplane flown to Australia from England by Mr. C. A. Butler in record time was also fitted with a B.T.H. magneto.

Social Events

Henley's Dramatic Club presented *The Barton Mystery* (Walter Hackett) at the Cripplegate Theatre, E.C., on November 13th. The choice of play was not too fortunate, we think, but within the limits imposed the company did very well. Top marks go to Miss Hilda Sneddon and Miss Eileen Hannon of the ladies, while Messrs. W. G. Turner, F. J. Bettley, and H. Stanley share the honours for their presentation of the principal male rôles. These were ably supported by Miss Edith Wade, Miss K. Selley and Miss K. Thurgood, and Messrs. R. Almond and W. Hancock. The production was in the capable hands of Mr. T. H. Spencer and music was provided by the Roseblade Light Orchestra.

A performance of *Passing Brompton Road* was given last night by the G.E.C. Dramatic Society at Magnet House, Kingsway, W.C.2.

Trade in Sumatra

A Department of Overseas Trade survey of the economic position of the East Coast Province of Sumatra for the first half of the current year, states that trade is suffering from over-capitalisation as regards a number of products, the price of rubber in particular having decreased in some cases to below the production cost. Imports have fallen to the level of 1922 and 1923 and have been reduced by 50 per cent. as compared with 1929.

Accumulator Parts for Jugo-Slavia

According to the *Board of Trade Journal* the Jugo-Slav Minister of Commerce and Industry has issued a circular which provides that articles and materials for use in the manufacture of accumulators may be admitted into Jugo-Slavia free of duty when imported by concerns manufacturing accumulators in that country.

Buenos Aires is maintaining its reputation for modernity. The new City Hotel illustrated above by a reproduction from the "Westinghouse International" shows the class of building now being erected in the city. A great deal of electrical work and equipment are involved in its construction and operation

The mammoth sign in Trafalgar Square

The " Monarch of Bermuda "

On November 12th a large party inspected the new quadruple-screw electrically-propelled luxury liner the *Monarch of Bermuda* as she lay in the Clyde off Greenock. The vessel was built to the order of Furness, Withy & Co., Ltd., launched on March 17th last from the yard of Messrs. Vickers, Armstrong, Ltd., at Walker-on-Tyne, and was described in the ELECTRICAL REVIEW of March 27th. She has now completed her trial runs on the Clyde and has left on her maiden voyage to the United States. It was found necessary to sacrifice the space usually devoted to purely utilitarian purposes to passenger comfort; as, moreover, the draught had to suit the 27 feet or so of Bermuda waters, the main machinery has been placed between the lowest passenger deck and the bottom of the hull. The whole of the electrical equipment, which includes not only the two 7,500-kW turbo-alternators but also baggage transport, cooking, washing, ventilating apparatus, and some 20,000 lamps, was supplied by the General Electric Co., Ltd. For maximum speed 1,900 h.p. is required. The 410 miles of Pirelli-General distributing conductors were wired by the Sunderland Forge and Engineering Co. Dr. M. J. Railing presided over a luncheon held after the inspection, at which 200 guests were present.

Buy British!

Inaugurating an intensive campaign launched this week by the Empire Marketing Board, the Prince of Wales, in a speech broadcast on Monday, made an urgent call to the country to " buy British." The appeal of the Marketing Board, he said, had always been to buy, whenever reasonably possible, first the produce of our own country, and next the produce of the Empire countries beyond the seas. The critical events of this autumn had given that appeal a new weight and a new urgency. The country had been buying more than it could pay for by its imports, and it was necessary to concentrate on using to the full what the nation's own farms and manufacturing plants could provide; the skill and craftsmanship of British people was a great national asset which must not be allowed to rust through lack of use. Manufacturers must produce goods of sound quality at reasonable prices, learn to market their products on more modern lines, and seek out new sources of British supply both at home and abroad.

At Trafalgar Square an enormous electric sign advocating " buying British " has been erected on the site where the new South Africa House is in course of construction. Employing 1,300 20-watt " Ediswan " lamps, the sign (which we illustrate) is 130 feet long and 80 feet high, with 15-ft. letters. The installation was carried out by Messrs. Maple & Co., Ltd., while the site has been lent for a fortnight by the Regent Advertising Co.

We also reproduce on page 785 a modernist poster by Mr. Clive Gardiner entitled " Making Electrical Machinery," which is being issued by the Empire Marketing Board in connection with its campaign.

Telephone and Telegraph Manufacture in Australia

A report issued by a special committee appointed by the Australian Postmaster-General and the Minister of Defence to inquire into the possibility of manufacturing telephone and telegraph equipment at certain Government factories and other places is against the proposal. The chairman of the Committee was Mr. A. E. Leighton. To undertake the manufacture of certain classes of such equipment, the report states, would require careful chemical, metallurgical and physical research. From experience of the manufacture of related items in Australia it was estimated that the cost would be at least twice that of imported articles, without taking research work into account. This preliminary work would take about two or three years and would cost about £30,000. There would also be a heavy outlay for machinery, and the tendency was for

The " Monarch of Bermuda ":—A. The main dance floor; B. Central fitting in the dining saloon; C. " Magnet " equipment in the main galley; D. A cabin de luxe

developments abroad to make such machinery obsolete. From June, 1927, to June, 1931, the expenditure of the Postmaster-General's Department on imported equipment was £2,251,000, or an annual average of £562,750. This was not a normal period, as a large development programme had been undertaken. The manufacture of all this equipment in Australia, if it were possible, would increase annual expenditure by at least £560,000, as manufacture in the Commonwealth added about 100 per cent. to the cost. The probable expenditure on imported equipment for the immediate future would be about £117,000 per annum. With the present facilities the manufacture could be undertaken of equipment at present imported to the value of £15,000 a year, and the extra cost would increase the annual expenditure of the Department by £24,000. This, however, would possibly be reduced by improvement in methods of mass production and lower costs for labour and material. The Committee recommends the gradual extension of the present policy of giving contracts to local manufacturers.

The Leipzig Fair

It is announced that the British Government has decided to take part in the Leipzig Spring Fair, which opens in March next, as one endeavour to increase overseas trade. According to *The Times*, the decision follows negotiations between the Department of Overseas Trade and the Association of British Exhibitors, which has been pressing for participation by the British Government for some considerable time. Mr. A. Markham, a director of the Association, states that that body has constantly urged that, quite apart from the importance of the Leipzig Fair from the international point of view, the psychological effect of the fact that it is held immediately after the British Industries Fair should not be overlooked. Information compiled in the past few years demonstrates that many foreign buyers who visit Olympia and Castle Bromwich refuse to make up their minds to buy before seeing what Leipzig has to offer. As a result several British firms now exhibit at both.

German Electrical Imports and Exports

The official returns just to hand show that the imports of electrical machinery and apparatus into Germany during September last reached a total of £162,800, bringing up the aggregate imports during the first nine months of the year to £1,367,100, as compared with £1,572,150 in the corresponding nine months of 1930. The exports of similar material from Germany are returned at £2,071,850 for September last and £17,694,900 for the nine months, the latter figure comparing with £21,316,250 in the corresponding period of last year. The import total was made up of electrical machinery and parts (£265,700) and apparatus (£1,101,400). The respective figures for the exports were £3,216,350 and £17,694,900.

Finnish Electrical Trade

There was a decline from 1,984 to 1,794 metric tons in the imports of electrical machinery into Finland during 1930, according to a Department of Overseas Trade report on economic conditions in that country by Mr. C. B. Jerram, Commercial Secretary to the British Legation at Helsingfors; for the first six months of the current year the figure was only 548 metric tons. Of the 1,794 metric tons imported in 1930 Great Britain was responsible for 49 tons. Imports of insulated cables, etc., fell from 2,405 metric tons in 1929 to 1,800 last year, while for January-June, 1931, the figure was 742 tons. The report states that the United Kingdom is Finland's best customer, and Finnish exporters are alive to the desirability of increasing their imports from her in order to retain her good will. British exporters may therefore well take the opportunity to renew their interest in the market and improve their present methods. Germany at present is the largest supplier of goods to Finland.

Polish Electrical Imports

The imports of electrical machinery, equipment, and supplies into Poland during the six months ended June last attained a value (taking an exchange rate of 43.38 zlotys to the £) of £659,290, as compared with £899,030 in the corresponding period of 1930.

German-Swiss Co-operation

It is announced that the German Siemens group has entered into a patent understanding with the Swiss Brown-Boveri Company for the mutual utilisation of patent rights by themselves and allied companies. The object is said to be to avoid patent applications, nullity suits and complaints of infringements.

The Spanish Radio Market

There is a growing market for radio apparatus and sets in Spain, according to *Commerce Reports*. In Valencia a broadcasting station has been inaugurated, and the territory, which has a population of approximately 3,000,000, offers an attractive market for radio goods. Crystal sets and earphones have become popular in the district, and a wide variety of this type of apparatus of Spanish, American, German and British manufacture has made its appearance. In the Seville district the demand for radio products is increasing. Over half of the receiving sets in use are of the crystal variety, the cost of valve sets restricting their sale. In Barcelona, however, two- and three-valve sets are being sold in large numbers, and there is an increasing demand for the more expensive sets.

Trade Announcements

MESSRS. HENRY SIMON, LTD., have taken over the business hitherto carried on by Turbine Gears, Ltd., and in future the manufacture of double helical and other gears will be undertaken at Messrs. Simon's works at Cheadle Heath. In order to retain the individuality a new company, Turbine Gears, Ltd. (Subsidiary of Henry Simon (Engineering Works), Ltd.), has been formed to carry on the trading activities of the gearing section.

An arrangement has been entered into between G.W.B. ELECTRIC FURNACES, LTD., and DEMAG-ELEKTROSTAHL G.m.b.H., Düsseldorf, whereby the former will have the sole selling rights for "Demag" electric aluminium melting furnaces in the British Isles. These furnaces are at present made up to a capacity of about two tons and an input of 500 kW.

The STELLA CONDUIT CO., LTD., announces that its Southampton branch is now under the control of Mr. William Carson, at 1, Back of the Walls.

MESSRS. FENEMORE, HOWLETT & CO., LTD., electrical contractors, of Victoria Street, Windsor, have opened a branch establishment in High Street, Ascot.

New London Glassware Showroom

Messrs. Hailwood & Ackroyd, Ltd., have recently opened showrooms at 71-75, New Oxford Street, W.C., where they are displaying an extensive range of "Hailware" glassware and lighting fittings.

The Application of Modern Lighting

An interesting paper was read last week by Mr. A. B. Read, director of fittings design, Messrs. Troughton & Young, Ltd., at a conference held by the Northern Counties' Section of the British Electrical Development Association. "Modern Lighting" was the subject of the address, which was supplemented by a number of slides demonstrating the application of modern lighting both on the Continent and in this country. The audience, numbering about eighty, included representatives from nearly every town in the northern area.

New Zealand Public Works Loan

It is reported that the Finance Bill, which has been introduced in the New Zealand House of Representatives, authorises the raising of a loan of £3,000,000 for public works, including telegraph extensions, and for railway purposes.

Dividing Radio Markets

It is reported in the German newspapers that despite pending patent actions in Germany between the Philips' Lamp Co. and the Telefunken Company, negotiations recently took place which have led to an understanding in regard to the division of the Swedish market. Similar arrangements are said to be held in prospect with regard to the markets in Belgium, Switzerland and Poland.

Commercial Travellers' Dinner-dance

The Electrical Trades Commercial Travellers' Association is holding its annual dinner and dance at the Criterion Restaurant on Friday, November 27th.

Russian Lamps for South America

It is reported from Montevideo that the Russian South American Trading Organisation has entered into an agreement with South American firms for the delivery of Russian glow lamps to Uruguay. At the same time negotiations are proceeding with a view to the supply of lamps to Peru.

Prices of Materials

Messrs. F. Smith & Co. report, November 18th: No change in the prices of silicium bronze wire and electrolytic copper.

Messrs. Edward Till & Co. report, November 18th: India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, November 18th: Copper bars (best selected), sheet and rod, no change. English pig lead, £16 5s., 5s. dec.

Dumfries Showroom Scheme Rejected

A proposal by the Electricity Committee to extend its premises at Leafield Road for the purpose of providing a showroom for electrical appliances, at an estimated cost of £600, was defeated at the last meeting of Dumfries Town Council.

New Australian Companies

Among the new companies registered recently in Australia are: J.C.A. Products, Ltd. (229, Adelaide Street, Brisbane), with a capital of £10,000 in £1 shares, manufacturers of and dealers in radio, electrical and mechanical apparatus, etc.; Herberhold's Dry Batteries (Australia) Proprietary, Ltd. (Melbourne), with a capital of £30,000; and the Mobile Broadcasting Pty., Ltd. (430, Little Collins Street, Melbourne), with a capital of £2,000 in £1 shares.

The Electrical Trade of Palestine

A report on economic conditions in Palestine has been prepared for the Department of Overseas Trade by Mr. K. W. Stead, Director of Customs, Excise and Trade, Haifa (H.M. Stationery Office, 1s. 6d. net). This states that until 1929 Germany held the premier position amongst countries exporting machinery to Palestine, but, with the establishment

of industries in which British capital is invested, the imports of machinery from the United Kingdom have increased and in 1930 they rose to first place in the list, the imports of machinery increasing from £P88,710 in 1929 to £P131,492 in 1930, while German imports decreased from £P96,530 to £P74,645. Internal combustion engines and electrical machinery form the bulk of the imports from the United Kingdom. Our share of the import trade in electrical goods during 1930 amounted to £P48,064, the next largest supplier being Germany with a value of £P30,000. The completion of the hydro-electric power station at Jisr Majame on the Jordan River has been delayed by damage to the head-race band and transformer station. It is expected that power from this station will be available early next year, and it has been announced that the price of electricity will be reduced as from January 1st, 1932. The use of electricity is gradually spreading and with the introduction of the reduced rates for electricity a market for domestic electrical appliances should be developed.

Recent Contracts

An order has been placed with the D.P. BATTERY CO., LTD., by Drake & Gorham, Ltd., for a D.P. battery consisting of 122 "L.S.H.21" size cells having a capacity of 1,560 Ah for the Prudential Assurance Co., London, to replace a smaller one which has been in use for many years. Orders and inquiries for "Kathanode" 'bus lighting batteries from the D.P. Company's stand at Olympia have been satisfactory. Amongst recent export contracts are a repeat order for 'bus lighting batteries for Egypt and an order for "Kathanode" starting and lighting batteries for the whole of the rail cars on the new Bermuda Railway.

The GENERAL ELECTRIC CO., LTD., has supplied "Osram" lamps for use throughout the new premises of the Equity Trustees Co., Bourke Street, Melbourne. In the main entrance, fifty "Cecoray" reflectors are employed in a special scheme of cove lighting.

Paraguayan Import Duties

By a recent Decree the customs duty on electrical apparatus and machinery imported into Paraguay has been increased by 25 per cent. as from August 1st last.

"Making Electrical Machinery"—a modernist design by Clive Gardiner employed by the Empire Marketing Board for one of its "Buy British" posters

Meeting of Creditors

John Hands & Sons, Ltd., and **Hollings & Guest, Ltd.**—A meeting of creditors of these companies was held in Birmingham on November 5th under the chairmanship of Mr. L. M. May (director of the Delta Metal Co., Ltd.). It was decided that Mr. H. H. Graham should be appointed controller of the two companies and the following committee was appointed to represent the creditors: Representatives of the Delta Metal Co., and Bakelite, Ltd., and Messrs. F. E. Dendall and A. Cripwell. This committee was asked to consider a number of proposals relating to the amalgamation of the companies, a settlement with the bank, and the position of unsecured creditors. A communication is to be sent to the creditors when the controller and the committee are in a position to make a report.

New Catalogues and Lists

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.4.—A booklet dealing with architectural lighting methods.

Normand Electrical Co., Ltd., 3, North Side, Clapham Common, S.W.4.—A humorous circular relating to electric motors.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—Leaflet No. 1715 on contactor type brakes.

C. A. Parsons & Co., Ltd., Heaton Works, Newcastle-on-Tyne.—A leaflet describing the company's inverted condensers.

D. M. Lumsden, Millburn, Almondbank, Perth.—An illustrated booklet dealing with artificial sun-ray lamps for home use.

Fraser & Howard, 22, Ely Place, Holborn, E.C.1.—A leaflet describing the "Linley" universal lamp.

Electro Dynamic Construction Co., Ltd., Devonshire Grove, S.E.15.—A number of illustrated lists, giving details of rotary transformers, convertors for battery charging and radio receiver operation, etc.

Cryselco, Ltd., Kempston Works, Bedford.—The company's new season's showcards, two being cut-outs of the company's opal lamps and the third illustrating various types of lamps with "Colonel Chris Elco" in the centre, backed by silvered cardboard, on which Cryselco stands out boldly in red.

Fuller Electrical and Manufacturing Co., Ltd., 5, Chancery Lane, W.C.2.—Pamphlet No. R.R. 101 dealing with "on-load" voltage regulators.

Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.—Leaflet O.E.B. describing cast-iron outdoor inverted cable end boxes (hooded type) for wall or pole mounting.

Premier Electric Heaters, Ltd., Keeley Street, Birmingham.—An 88-page illustrated catalogue (No. 170) of electric heating appliances.

Brook Motors, Ltd., Empress Works, Huddersfield.—List No. 308, containing particulars of high-torque squirrel-cage motors.

J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.—A factory and workshop lighting number of "The Crabtree" magazine.

Hendon Lamp and Accessories Co., Ltd., 104, Southampton Row, W.C.1.—A price list of "Hendon" lamps.

George Green & Co., Chapel Road, West Norwood, S.E.27.—A leaflet describing "Gee-Gee" electric geysers and towel rails, with particulars of reduced prices.

J. J. Eastick & Sons, 118, Bunhill Row, E.C.1.—A descriptive post-card of "Eelex" switches.

Vickers-Armstrongs, Ltd., Broadway, Westminster, S.W.1.—A leaflet relating to "Vickers-Nash" safe load indicators for cranes.

Straight-Lite Reflectors, Ltd., 73, Canonbury Road, N.1.—List No. 40, containing particulars of the company's latest tubular signs and reflectors.

Bankruptcy Proceedings

Langdon's Radio (trading as J. & M. Lazarus), wireless and electrical dealers, 217, Golders Green Road, and 13, Craven Park Road, Willesden.—These debtors again attended at the London Bankruptcy Court on November 13th before Mr. Registrar Mellor for public examination upon accounts showing liabilities £388 and assets "nil." The business was started in July, 1930, and came to an end in January last, the failure being attributed to lack of capital, trade depression, keen competition and insufficiency of profits to meet overhead charges and drawings. The examination was concluded. The following are the principal creditors:—

	£		£
Beavor Electrical, Ltd. ...	108	Tonbkin, J.	52
Maxwell & Co.	34	Chorton Metal Co. ...	30

Granville Burgess (trading as Granville Burgess & Co.), electrical engineer, Museum Chambers, Bury Street, W.C.—This debtor, who was adjudged a bankrupt in July, 1914, with ranking liabilities estimated at £463, applied to Mr. Registrar Warmington in the London Bankruptcy Court on November 16th for his discharge. The Official Receiver said that the assets had realised £82, and, after payment of preferential claims of £22, a dividend of 11½d. in the £ was paid. The Official Receiver opposed the application on two statutory grounds, and the discharge was suspended for one month.

R. F. Davis, electrical engineer, 21, Derringham Street, Kingston-upon-Hull.—The receiving order was made recently on the debtor's own petition. According to the statement of affairs there are liabilities of £387 against assets of £72. The first meeting of creditors has been held.

S. Schorah, journeyman electrician, 12, St. Gabriel's Avenue, Brownhill, Blackburn.—First meeting, November 17th, at the Official Receiver's office, District Bank Chambers, Blackburn. Public examination, December 16th, at the County Court House, Victoria Street, Blackburn.

W. H. Thornton, electrical and wireless engineer, 25, Bridge Street, Burnley.—Trustee, Mr. J. W. Carter, District Bank Chambers, Blackburn, Official Receiver, released October 30th.

A. R. King (Kingston Radio Co.), wireless dealer, 18, Vernon Street, Newark.—Last day for receiving proofs for dividend, November 28th. Trustee, Mr. L. A. West, 22, Regent Street, Park Row, Nottingham, Official Receiver.

J. T. Lord, electrical engineer and contractor, Commercial Buildings, Oakworth, near Keighley.—First and final dividend of 6s. 1d. in the £, payable November 17th at the Official Receiver's office, 12, Duke Street, Bradford.

E. O. Sturgeon, electrical engineer, 88, Northgate, Hartlepool.—First and final dividend of 2s. 1½d. in the £, payable November 30th at 71, Albion Street, Leeds.

Company Liquidations

Electradio Co., Ltd., 25, Westbourne Grove, W.—The statement of affairs filed in the compulsory liquidation of the company shows total liabilities of £4,500 (of which £4,274 is unsecured), no assets, and a deficiency as regards shareholders of £5,274. The following are the principal creditors:—

	£		£
Barclays Bank ...	923	Johnson Talking Machine	
Behr, Max	211	Co., Ltd.	59
Black, Miss A. S. ...	700	Rist, A., Ltd.	246
Cleeve, H. R., & Co.	63	Wright, T. J., & Co., Ltd.	78
Faudels, Ltd. ...	105		

Peterborough Electric Traction Co., Ltd.—Winding up voluntarily. Liquidators, Mr. W. E. Bennett, 88, Kingsway, W.C., and Mr. J. Worssam, 20, Lower Clarence Road, Norwich.

South Staffordshire Tramways Co., Ltd.—Meeting, December 14th, at 88, Kingsway, W.C., to receive an account of the winding-up by the joint liquidators, Mr. C. W. Francis and Mr. T. H. Underhill.

Border Electrical Factoring Co., Ltd.—Meetings, December 11th, at 14, Lowther Street, Carlisle, to receive an account of the winding-up by the liquidator, Mr. T. E. Williams.

Thorpe & Thorpe, Ltd.—Particulars of claims by November 27th to the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C. (The registration of a new company is recorded in this issue.)

Rotor Signs (England), Ltd.—Particulars of claims by December 14th to the liquidator, Mr. B. T. Crew, 4, Dove Court, Old Jewry, E.C.

Dorking Electricity Supply Co., Ltd.—Meeting, December 14th, at Broad Sanctuary Chambers, S.W.1, to receive an account of the winding-up by the liquidator, Mr. H. Fraser.

Lechlade Electric Light & Power Co., Ltd.—Meeting, December 14th, at Broad Sanctuary Chambers, S.W., to receive an account of the winding-up by the liquidator, Mr. H. Fraser.

Electricity Supply

Lighting, Domestic, Power

Adwick-le-Street. — INSPECTION OF UNDERTAKING. — The Urban District Council has decided to engage the engineer and manager of the Seaham Harbour electricity scheme to inspect and report on the electricity undertaking.

Aldershot.—REDUCED METER RENTS.—The Town Council has introduced a reduced scale of charges for electricity meters.

Australia.—SYDNEY.—The report of the City Electricity Department for August discloses a surplus of £6,216, reducing the deficit of £61,672 at the end of July to £55,456. Electricity sold totalled 28,367,788 kWh, as compared with 30,277,812 kWh in the corresponding month of 1930. Pursuing its "economy" campaign, the Electricity Committee has recommended that the resident engineer at Bunnerong power station be given a month's notice.

COMMISSION'S APPLIANCE SALES.—In reply to a question in the Victorian Legislative Council it was recently stated that the value of the sales of electrical appliances and fittings by the Electricity Commission during 1930-31 was £72,811.

TASMANIA.—The Tasmanian Hydro-electric Commission is investigating the demand for electricity in the north-eastern districts with a view to extending the hydro-electric system.

Bexley.—PRICE REDUCTIONS.—The following reduced charges have been put into operation:—Lighting: From 5d. to 4½d. per kWh. Power: From 1¾d. to 1½d. per kWh.

Bridlington.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer: Mr. A. J. Beckett) for the twelve months ended March 31st last show a total revenue of £34,159, a working expenditure of £18,364 and a net profit of £7,166. During the year the capital expenditure amounted to £3,323, making a total of £131,194 now spent on the undertaking. Electrical energy sold increased from 1,861,347 to 1,972,394 kWh and the maximum supply demanded from 1,133 to 1,333 kW. The average price obtained per kWh rose from 3.86d. to 4.15d. There are now 3,664 consumers, an increase during the year of 233.

Bridport.—NEW GENERATOR STARTED UP.—A new 330-b.h.p. generating set installed at the electricity works by Crossley Bros., Ltd., Manchester, was started up on November 12th.

Canada.—THE ST. LAWRENCE WATERWAY.—The St. Lawrence Waterway Scheme was advanced a further stage last week by the decision of the Canadian and United States authorities to reconvene immediately the Joint Engineering Board which has been considering the question. The Board will decide whether to construct one or two dams between the points of Prescott and Cornwall. The aim of the project is to secure a navigation depth of 25 or 27 ft., and to develop 2,215,000 h.p. of hydro-electric power which will be shared between Canada and the United States. At present there is only a 14-ft. channel westward of Montreal. The negotiators, Mr. Stimson, American Secretary of State, on the one hand, and Major W. D. Herridge, Canadian Minister, on the other, will also discuss the allocation of works and the division of costs estimated at $265,000,000.—*Reuter* (Washington).

GENERATION IN AUGUST.—The Dominion Bureau of Statistics at Ottawa reports that the output of Canadian central power stations in August totalled 1,251,715,000 kWh as compared with 1,411,860,000 kWh in August, 1930.

HYDRO-ELECTRIC DEVELOPMENT.—The Nova Scotia Power Commission now has seven electrical power distribution systems in operation and a capital investment of approximately $13,500,000. According to a recent official statement, output during the year ended September 30th last was six times as large as in 1925, representing an increase from 25,458,067 kWh to 151,650,000 kWh during the year under review. Turbine capacity has grown during the same period from 22,580 h.p. to 62,875 h.p., while the mileage of transmission and distribution lines has increased from 94 miles to 266 miles, an addition of 55 miles of line being under construction.

MATTAGAMI RIVER DEVELOPMENT.—Hydro-electric power development on the Mattagami river plays an important part in the development of the mining and pulp and paper resources of northern Ontario. Three plants on the upper river, with 27,800 h.p. installed, furnish power to the Porcupine gold area while lower down a pulp mill at Smooth Rock Falls is served with an installation of 9,350 h.p., and the largest development on the river at Smoky Falls, with 56,250 h.p. installed, furnishes power to the pulp and paper mills at Kapuskasing.

Continental.—FINLAND.—A Department of Overseas Trade report by Mr. C. B. Jerram, Commercial Secretary to the British Legation at Helsingfors, states that in 1930 the number of generating plants in Finland was 419, with an aggregate capacity of 459,937 kW. The total output was 1,206 million kWh, of which 868 million kWh was generated from water power. Industry accounted for 966 million kWh. During the year the Government's Imatra power station, having a capacity of 75,000 kW, was completed.

FRANCE.—According to the *Revue Générale d'Electricité*, the output of the 48 principal electric power stations in France during August last amounted to 738,123,115 kWh, bringing the total for the first eight months of the year to 5,972,325,286 kWh, as compared with 6,560,411,534 kWh in the corresponding period of 1930, a decrease of nearly 9 per cent. Of the total, hydro-electric plants were responsible for 3,436,170,840 kWh and steam and internal combustion engine stations for 2,536,154,446 kWh.

SWEDEN.—It is stated that the power for the Stockholm-Malmö railway, which is to be reconstructed for electric traffic by the spring of 1934, will be supplied by the Government-owned hydro-electric power stations and stations belonging to the private combine Sydsvenska Kraftaktiebolaget. This combine has recently asked the Government for a concession for the construction of a h.p. circuit 170 km. long for this purpose at a cost of Kr. 2,550,000.—*Reuter's Trade Service* (Stockholm).

Cookham.—SUPPLY TO WALTHAM ST. LAWRENCE.—The Rural District Council has approved plans for the installation of overhead and underground cables at Waltham St. Lawrence by the Ascot District Gas and Electricity Co.

Cramlington (Northumberland).—GENERATING PLANT.—The Co-operative Wholesale Society proposes to install at its central premises an electric generating set costing about £1,600.

Ealing.—EXTENSIONS.—The borough electrical engineer has been authorised to extend mains to supply electricity to a large block of flats and shops now being erected in the Hanger Lane, near Vicar's Bridge, for Messrs. Percy Bilton (Inc.).

Glasgow.—MAINS EXTENSIONS.—The Corporation Electricity Committee recommends the laying of distributing mains at a cost of £7,279.

Grimsby.—ELECTRICITY FOR FLOUR MILLS.—A sum of £3,900 has been voted by the Electricity Committee for sub-station building and equipment in connection with a supply to the Grimsby Flour Mills.

Hailsham.—SUPPLY TO RURAL AREA.—With reference to the supply of electricity in the rural area, the Electricity Commissioners have informed the Rural District Council that there are no reasonable grounds for recommending the Minister of Transport to revoke the Weald Electricity Supply Company's powers in the district. The Council has accordingly decided that the chairman and clerk shall meet representatives of the company to discuss the mains to be provided, and the dates by which the supply is to be made available.

Halifax.—YEAR'S WORKING.—The account of the Corporation electricity undertaking (engineer and manager: Mr. E. A. Mills) for the year ended March 31st last shows a total income of £196,041, as compared with £199,764 in the preceding year. Working expenses were £93,644, as against £89,493, leaving a gross profit of £102,397 (£110,271), to which was added revenue from other services making £108,797. After providing for capital charges, &c., there was a net profit of £25,518, as compared with a surplus of £38,869 in 1929-30. The decrease in profit is chiefly due to expenditure on new apparatus and maintenance of appliances, together with a reduction of charges to consumers for lighting and power purposes. The sales of electricity increased from 32,290,771 to 32,317,629 kWh, but the maximum supply demanded decreased from 17,500 to 16,200 kW.

Lichfield.—TEMPORARY SUPPLY.—The City Council has arranged with Sutton Coldfield Town Council to give a supply of electricity to Shenstone Wood End and Little Hay until the City Council's e.h.p. mains are extended, on condition that the City Council divides the revenue received equally between the two authorities. The cost of providing the supply is estimated at £445.

London.—L.J.E.A. INQUIRY.—The Electricity Commissioners are to hold an inquiry on December 14th at Savoy Court, Strand, in connection with a draft Order amending the London and Home Counties Electricity District Order, 1925.

ST. MARYLEBONE.—The Electric Supply Committee recommends that an agreement be entered into with Mr. A. B. Falkner, of 24, Ossory Road, S.E., for the installation of mains in the block of flats being erected in Seymour Place by Crawford Street, at a total estimated cost to the Council of £1,175.

Lowestoft.—SUPPLY DIFFICULTIES.—The Electricity Committee is to circularise consumers asking them to assist reduce their consumption of electricity at peak periods.

Manchester.—PROGRESS DURING SEPTEMBER.—During the month of September the Corporation Electricity Department recorded an increase of 2,554 kW in connections, making a total of 458,702 kW. Applications for supplies, including additional supplies, numbered 1,951, representing a total of 3,992 kW. New cookers connected totalled 144, making 8,327 now on circuit; in addition 194 orders were received for the hire of cookers. Further plant was installed at three existing sub-stations and good progress was made with the changing-over of consumers from d.c. to a.c., the number changed over at September 30th being 17,173.

YEAR'S WORKING.—The annual report of the Manchester Corporation shows a surplus of £111,776 on the electricity undertaking.

New Zealand.—WELLINGTON.—In his report on the operation of the Corporation Electricity Department for the year ended March 31st last, Mr. M. Cable, general manager, states that the revenue of the undertaking amounted to £357,287, as compared with £358,925 in the preceding year, while working expenses increased from £162,706 to £169,206. After making provision for capital charges (£79,286) and special expenditure (£53,258) and transferring £10,000 to the District Fund, there was a net surplus of £45,537, as against £44,444 in the previous year. During the year capital expenditure

amounted to £65,094, bringing the total now spent on the undertaking to £1,151,392. Electrical energy sold rose from 41,329,434 to 47,761,586 kWh, there being an increase of approximately five million kWh in the electricity consumed for heating purposes. The number of consumers rose by 2,000 to 28,700, while the maximum load was 18,528 kW, as against 15,424 kW. The average price obtained per kWh decreased from 2.06d. to 1.63d.

CHRISTCHURCH.—We have received from Mr. J. C. Forsyth, acting general manager, a copy of the annual general report and balance sheet of the Municipal Electricity Department for the year ended March 31st last. For the first time in the history of the Department, both the revenue and sales of electricity failed to show an increase. Revenue amounted to £219,433, as compared with £226,829 in the preceding year, while the energy sold fell from 47,564,061 to 46,285,245 kWh. The total expenses (including capital charges) rose from £183,263 to £194,421 and there was a credit balance of £25,012, as against £43,566. The capital outlay on the undertaking was increased during the year by £62,359, making the total capital expenditure £770,063. The maximum demand rose from 13,340 to 15,145 kW and 1,021 new consumers were added, raising the total to 31,714.

ELECTRICAL DEVELOPMENTS.—A scheme costing £40,000 for the supply of electricity to parts of the counties of Patea and Hawera is being considered by the South Taranaki Electric Power Board.

LAUNCESTON.—An increase from £89,283 to £103,282 in revenue is recorded in the report of the city electrical engineer, Mr. R. J. Strike, on the working of the electricity supply undertaking during the year ended June 30th, 1930. Working expenses totalled £78,426, as against £55,400, and after making provision for loan interest (£13,448) and sinking fund contributions (£3,228), there was a net surplus of £8,181, as compared with £17,275. The capital expenditure now stands at £266,804, £5,125 having been spent during the year. Sales of energy rose from 11,423,221 to 14,335,768 kWh and the maximum load from 5,066 to 5,234 kW. The average price obtained per kWh was 1.337d.

Northern Ireland.—CARRICKFERGUS (CO. ANTRIM).—The electricity scheme which has cost approximately £33,000, was inaugurated on Friday last, Mr. John Campbell, J.P., chairman of the Electricity Committee, switching on the supply at the transformer kiosk, Market Square. The square and the centre of the town only are lighted at present, but the remaining streets will be lighted before the New Year. The contract was carried out by Messrs. W. T. Henley's Telegraph Works Co., Ltd. The charges will be 8d. per kWh for lighting, 1d. for power, and ¾d. for unrestricted supply.

Northfleet.—STREET LIGHTING.—The Urban District Council Highways Committee is to ascertain from the Gravesend Corporation the cost of lighting streets on the Wombwell Estate by electricity.

Slaithwaite.—REVISED ELECTRICITY CHARGES.—The Urban District Council has revised its scale of electricity charges as follows:—Lighting: Flat rate, from 5½d. to 5d. per kWh; room rate, to 3s. 9d. per room per quarter, with a minimum of 11s. 3d. per quarter, plus 1d. per kWh up to 500 kWh per quarter, and ½d. beyond. Meters rents: Up to 50 A, 9d. per quarter; over 50 A, 2s. 3d. per quarter for the first meter, and 1s. 6d. per quarter for each additional meter. There is to be five per cent. discount.

South Africa.—DURBAN.—An important scheme for supplying electricity to watering places along the Natal south coast from Umbogintevini to Karridene has just been inaugurated by the Durban Corporation.

WYNBURG.—A £10,000 loan is to be raised by the municipality for a new power station, plant and transmission system.

JOHANNESBURG.—Several alternative schemes are proposed with a view to augmenting the city's electricity supply. They include the installation at the Jeppe Street power station of two 15,000-kW sets; the installation of one such set, with a partial supply from the Victoria Falls and Transvaal Power Co., Ltd.; and a partial supply only from the Victoria Falls Co.

PAARL.—The Town Council recently decided to spend £60,000 on the erection of its own power station, but the Mayor, Mr. A. M. Devine, now states that the Council has succeeded in making a better contract with the Electricity Supply Commission, the tariffs having been reduced by 33 to 40 per cent. Mr. Devine says that so long as the Commission realises that Paarl is the fifth largest consumer in the Union and will meet it halfway, the town will not build its own power station, but if favourable terms are withdrawn the Council will again bring forward a proposal for providing its own supply. A sum of £6,000 is to be spent on reinforcing the mains.

South Shields.—ELECTRIC WASH-BOILERS FOR ESTATE.—The Corporation Housing Committee recommends the installation of electric wash-boilers in houses on the Tyne Dock Estate.

PUBLIC LIGHTING.—The borough electrical engineer has submitted to the borough engineer a revised estimate of £29,000 for the conversion of all existing gas lamps to electricity.

Stoke-on-Trent.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £1,000 for works in connection with a supply to the Burslem premises of the Industrial Co-operative Society, Ltd.

Stow-on-the-Wold. — EXTENSIONS. — The Urban District Council has granted permission to the Shropshire, Worcestershire and Staffordshire Electric Power Co. to extend cables in Oddington Road and to erect overhead lines to Council houses.

Surbiton.—STREET LIGHTING.—The Urban District Council has decided to adopt electricity for street lighting, and to enter into a ten years' contract with the London and Home Counties Joint Electricity Authority. For equivalent lighting electricity will cost £3 5s. 6d. per lamp, against £3 15s. 5d. for gas, representing a saving of about £500 per annum.

United States.—LARGE POWER DEVELOPMENTS.—*Power* states that the $30,000,000 hydro-electric plant of the Union Electric Light Company of St. Louis, on the Osage River, near Bagnell, Mo., was started up on October 19th. The plant will develop 268,000 h.p., and energy is transmitted to St. Louis and to St. Francois County to serve the mines and smelters of the St. Joseph Lead Company.

Final approval of the plans and specifications for the 50,000-kW thermal plant to be built by the San Joaquin Light & Power Corporation at Herndon, Calif., about 11 miles north of Fresno, has been given, and construction will be started in the next two or three months. The project comprises a power plant, a sub-station, and a pipe line for the transmission of natural gas from Kettleman Hills at a total cost of $6,210,000.

Wakefield.—CHEAPER ELECTRICITY.—The Corporation Electricity Committee recommends a reduction of ½d. per kWh in the charges for electricity.

Walton-on-Thames.—LOWER CHARGES.—The following reductions are being made in the charges for electricity:—Lighting: To 6d. per kWh. Power: To 3d. per kWh for the first 3,000 kWh per quarter and 2d. beyond. Domestic tariff: Fixed charge of 1½d. per annum per sq. ft. of floor area, reduced to 1d. where the floor area exceeds 5,000 sq. ft., the fixed charge for every additional 100 sq. ft. to be calculated at the reduced rate of 6s. per 100 sq. ft.

West Riding.—ELECTRICITY FOR INSTITUTION.—The County Council has arranged with the Electrical Distribution of Yorkshire, Ltd., for a supply of electricity to the Oulton Hall Institution.

Wheaton Aston (Stafford).—SUPPLY NEXT MONTH.—It can now be definitely stated that a supply of electricity will be available in the first week of December. The Wolverhampton Corporation Electricity Department is arranging to give a series of demonstrations on the day of its inauguration.

Wingate (Durham).—PROPOSED LIGHTING OF VILLAGE.—At the monthly meeting of the Parish Council a letter was read from the County of Durham Electrical Power Distribution Co., Ltd., stating that it hoped to lay before the Council during the next few weeks plans and the estimated cost of the lighting of the parish.

Wiveliscombe (Somerset).—SUPPLY AVAILABLE.—A supply of electricity has been provided by the Wellington District Electricity Co., Ltd., and an extension will eventually be made to Minehead. There is a fixed quarterly charge, plus 1½d. per kWh consumed.

The South-East England Scheme: (Left) The delivery of a 132,000-V transformer for the Hythe sub-station, adjoining the Colchester Corporation's generating station. (Right) The outdoor switchgear of the Hythe sub-station

Traction

Ayr (Scotland).—PROPOSED TRAMWAY ABANDONMENT.—The Scottish Motor Traction Co., Ltd., has made an offer to purchase the municipal tramway undertaking and substitute an omnibus service. A sub-committee of the Town Council has been appointed to consider the matter. The offer made was one of £15,000 down and £1,500 a year for a period of 21 years. If the Council is agreeable the company suggests that the transfer should take place at the beginning of the year. Ayr tramways have been in operation for 30 years and last year they incurred a loss of £3,450. There is an outstanding debt of £54,039.

Chatham.—AUTOMATIC TRAFFIC CONTROL.—The Kent County Council is to install automatic traffic signals at the junction of Railway Street and Military Road at a cost of £260.

Continental. — SWITZERLAND. — The electrification work having been completed, the running of electric trains on the Basle-Delsberg section of the Swiss Federal Railways, a distance of nearly 24 miles, has just been commenced. The Swiss Federal Commission for the Electrification of Private Railways is reported to have decided to grant a loan of £29,000 towards the cost of electrifying the Solothurn-Munster line.

London.—TUBE BREAKDOWN.—The fusing of a cable at the South Kensington sub-station at mid-day on Monday was responsible for a breakdown lasting half-an-hour on both the District and the Piccadilly lines.

PROGRESS OF PICCADILLY TUBE EXTENSIONS.—Excellent progress is being made with the extensions of the Piccadilly Tube which are being carried out northwards from Finsbury Park to Cockfosters (7½ miles) and westwards from Hammersmith to Northfields (4½ miles). The first section of the extensions, that between Finsbury Park and Arnos Grove, is expected to be open for traffic by next Whitsun, while the remainder will probably be completed by the end of the year. The total cost of the extensions will be approximately £9,000,000. As a consequence of the opening of the new lines a new schedule of times will be introduced whereby the average speed for the whole system will be increased from 18 to 25 m.p.h.

Madagascar.—RAILWAY ELECTRIFICATION SCHEME.—Plans are under consideration for the electrification of six railway lines in Madagascar. For one of the lines power will be supplied by a hydro-electric plant to be established on the river Fianarantsoa. In connection with the electrification work it is proposed to provide at the same time supplies of power in many rural districts.

Newcastle-upon-Tyne.—GOSFORTH OBJECTS TO TRAMWAY PROTECTION.—The Gosforth Urban District Council is to write to the Traffic Commissioners objecting to the protection given to Newcastle Corporation trams beyond Henry Street. It was stated that the fare stipulated by the Commissioners for this route was 1½d. less than the omnibus charges.

New Zealand.—WELLINGTON.—The accounts of the Corporation Tramways Department (general manager: Mr. M. Cable) for the year ended March 31st last record a total revenue of £453,676, a working expenditure of £355,360, and a net deficiency of £3,488. For 1929-30 the figures were: Revenue, £478,547; working expenditure, £377,348; and net surplus, £1,041. Capital expenditure during the year amounted to £23,855, making the total now invested in the undertaking £1,392,466. The number of passengers carried declined from 46,581,456 to 44,286,509, but the car mileage rose from 4,308,624 to 4,395,335.

LAUNCESTON.—In his report on the operation of the city tramway undertaking during the year ended June 30th, 1930, Mr. R. J. Strike, superintendent of tramways, states that the number of passengers carried (5,001,073) was the highest yet reached and represented an increase of 102,286 as compared with the preceding year. The car mileage increased by 36,139 to 524,136, the revenue per car mile being 21.361d. as against 22.458d. The total income rose from £49,302 to £50,856, while the working expenses amounted to £41,569 (£37,036). After providing for loan interest (£7,681) and sinking fund contributions (£1,847), there was a net deficit of £242, as compared with a net surplus of £3,635 in 1928-29. A sum of £7,919 was spent on the capital account, bringing the total expenditure on the undertaking to £164,359.

Salford.—YEAR'S WORKING.—There was a fall from £418,833 to £383,973 in the revenue of the Corporation Transport Department (general manager: J. S. D. Moffet) for the year ended March 31st last. Working expenditure amounted to £358,789, as against £372,768, and after providing for capital charges, depreciation, &c., there was a net deficiency of £10,601, which compares with a loss of £18,789 in 1929-30.

Southern Railway.—ELECTRIFICATION PROGRESS.—It is expected that a part of the new electric service, probably as far as Three Bridges, will be in operation in time for next year's holiday traffic. The completely electrified line to Brighton and Worthing will probably be opened by the end of next year. For the new services 38 all-electric cars are being constructed by the Pullman Car Company at a cost of nearly £200,000. Tests have also been carried out this week between Waterloo and suburban stations of two new electric coaches similar to those which it is proposed to run on the Brighton route.

Stretford.—TRAFFIC SIGNALS.—The Urban District Council is to install traffic signals at a cost of £150.

Communications

Finland.—TELEPHONY.—In a D.O.T. report on economic conditions in Finland the Commercial Secretary at the Helsingfors Legation states that the country's telephone system is extremely confusing; it is owned by several hundred different concerns, including the State. Schemes for the reorganisation and centralisation of the whole system have recently been drawn up by a Government Committee, but it is doubtful whether practical steps will be taken until the economic position improves. There are two alternative proposals: (a) that the Department of Posts and Telegraphs should take over the whole system for the Government; (b) that a concession, with Government participation, should be granted. Both proposals have their critics. Several well-known foreign concerns are already interested and active. The cost of reorganisation is estimated at about F.M.600 millions. The Södra Finland's Interurbana Telephone Company, in which a well-known foreign concern is said to hold the majority of shares, is spending during the present year some F.M.1.5 millions on extensions. During 1929 and 1930 connections were established with most European countries and the Continent of America.

BROADCASTING.—The number of wireless licences at the end of 1930 was 106,808, compared with 103,001 at the end of 1929 and 100,056 at the end of 1928. Programmes are broadcast by the O/Y Suomen Yleisradion from the two Government stations at Helsingfors and Lahti, but the granting of a more comprehensive concession is at present under consideration. The Helsingfors and Lahti programmes are re-transmitted by stations at Viborg, Tammerfors, and elsewhere.

France.—NEW RADIO STATION.—A new radio broadcasting station was inaugurated at St. Rémy-l'Honoré on November 14th. This new Radio-Paris plant has a power of 120 kW and it occupies a site of 214 acres on a plateau which is the highest point in the Department of Seine-et-Oise, the transmitter being linked with the studios in Paris by 30 miles of cable.

Holland.—"PCJ" CLOSED DOWN.—Philips Lamps, Ltd., announce that their well-known short-wave radio transmitter "PCJ" has closed down for a period of six months.

India.—RETRENCHMENT IN BROADCASTING.—Our Indian correspondent states that the Government of India has accepted the recommendation of the Retrenchment Committee to close down the two broadcasting stations at Calcutta and Bombay to effect a saving of Rs. 1,25,000. The Committee did not approve a proposal that the plant, machinery, apparatus and other equipment might be stored, but considered that the equipment should be sold outright.

The commercial community in Bombay is opposed to the closing down of the broadcasting service. It is pointed out that when funds were voted for it in the Legislative Assembly in March, 1930, the Government gave a pledge that it would be worked as an experimental measure until March, 1932, and on this guarantee many traders had stocked radio goods which now amounted in Bombay alone to more than 10 lakhs of rupees in value. It is understood that a deputation of the merchants of Bombay is likely to meet the Finance Member to ask him to reconsider the question. Meanwhile, the floating of a private company is being considered.

It is reported that the Marconi International Marine Company has offered to take over the Indian broadcasting service and maintain both the Calcutta and Bombay stations, as well as extend the service. The Government is considering the offer.

RANGOON RADIO BEACON.—The Commissioners of the Port of Rangoon have accepted a tender amounting to about Rs. 40,000 for a rotating loop radio beacon at Letkokon, at the mouth of the China Bakir river. The station is being manufactured to the specification of the British Air Ministry and will be entirely automatically controlled.

London.—TELEPHONE AREA EXTENSION.—Sixty-five exchanges with 50,000 subscribers at present outside the metropolitan area will come under the control of the London telephone service early next year. The change is being made to simplify administration and will not entail any difference in the charge for rentals or calls. The exchanges will be transferred from the Brighton, Canterbury, Colchester, Guildford, Reading, and St. Albans areas.

New Zealand.—RADIO LICENCES.—There are 63,477 receiving licences in force in the Dominion and, including dealers', transmitters', and special licences, there is a grand total of 64,927. In spite of the prevailing depression local radio dealers still report continued good business. There seems to be a growing demand for the best type of sets, which are naturally the most expensive. American apparatus has been most popular, but the currency difference may now favour the purchase of British products.

Plymouth.—DIRECTIONAL RADIO SIGNALS FOR SHIPS.—A wireless fog signalling apparatus is to be installed early next year by the Great Western Railway Co. at Rame Head, Plymouth, for the guidance of Atlantic liners and other vessels arriving at Plymouth in foggy weather. The radio directional apparatus will have a range of 25 to 30 miles.

Tunisia.—TELEGRAPHY.—During 1930 the length of the telegraph lines in Tunisia was increased to the extent of 607 miles, bringing the total in operation at the end of the year to 4,002 miles.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aberdeen.—November 30th. Directors of Royal Infirmary. Electric wiring installation at the medical block, New Infirmary, Forresterhill. Particulars from Mr. J. B. Nicol, architect, 367, Union Street, Aberdeen.

Czecho-Slovakia.—PRAGUE.—November 30th. Electricity Department. Supply during 1932 of 17,000 m. of 27,000-V cable, 55,000 m. of 3,600-V cable, and 211,500 m. of 1,000-V cable.

Denmark.—COPENHAGEN.—December 5th. State Railways. Electrification of Copenhagen suburban lines. (A.X. 11180.)*

Dundee.—November 23rd. Corporation Housing Department. Various works, including electric lighting, in connection with Sandemann Street housing scheme. Particulars from the official quantity surveyor, 91, Commercial Street.

Edinburgh.—December 1st. Corporation. Fifty air brake equipments for tramcars. Specifications, etc., from the transport manager, 2, St. James Square.

Egypt.—CAIRO.—December 8th. Department of Public Health. Automatic electric refrigerators. (G.X. 10889.)*

Fife.—November 23rd. County Council. Various works, including electric lighting, at twenty houses. Schedules, etc., from Mr. G. B. Deas, architect, Central Chambers, Kirkcaldy.

Iraq.—MOSUL.—December 30th (time extended). City Council. Complete town lighting plant. (November 6th.)

London.—METROPOLITAN WATER BOARD.—November 24th. (a) Steam turbine, centrifugal pumps, electric generator, etc., for the Walton pumping station, and (b) three electrically-driven vertical centrifugal well pumps and one set of electrically-driven horizontal tandem centrifugal pumps, etc., for the Hampton pumping station. Particulars (deposit £2 2s. each section) from the chief engineer, 173, Rosebery Avenue, E.C.1.

L.C.C.—November 23rd. Wiring and fittings for rewiring for electric lighting in certain wards of the City of London Institution, E.3. (November 13th.)

BETHNAL GREEN.—November 30th. Borough Council. Electric lighting installation work at tenements. (See this issue.)

CENTRAL ELECTRICITY BOARD.—December 18th. Construction of site works, foundation works, etc., at Cardiff and Newton Abbot. (See this issue.)

New Zealand.—WELLINGTON.—February 2nd. Public Works Department. Additional 11,000-V switchgear (A.X. 11163)* and reactors (A.X. 11161)* for Lake Coleridge power scheme.

April 5th. Distribution switchboards and alarm panels for the Waitaki power scheme. (A.X. 11191.)*

Trade Commissioner. Mechanical stokers. (G.X. 10928.)*

Rochdale.—December 1st. Electricity Department. Meters. (See this issue.)

Runcorn.—November 30th. Rural District Council. Electrically-operated pumping machinery, etc. Specifications, etc. (deposit £3 3s.), from Mr. J. O. Hunter, 69, High Street.

South Africa.—JOHANNESBURG.—December 3rd. City Council. Traction circuit breakers. (A.X. 11178.)*

December 14th. Railways and Harbours. Motor-driven vertical face grinding machine. (A.X. 11168.)*

January 4th. South African Railways and Harbours. Electric railway signalling apparatus for Salt River. (A.X. 11185.)*

RAND WATER BOARD.—December 30th. Turbo-driven centrifugal pump. (G.X. 10908.)*

January 5th. Water tube boiler, superheater, mechanical stoker, etc. (G.X. 10909.)*

DURBAN.—December 11th. Corporation. H.p. metalclad switchgear for Hewitt Road sub-station. (A.X. 11177.)*

Tadcaster (WEST RIDING).—November 28th. County Council Public Assistance Committee. Installation of inter-communication telephone equipment at County Poor Law Institution. Specifications, etc., from the county architect, County Hall, Wakefield.

Tutbury (STAFFS).—December 2nd. Rural District Council. Electrically-driven pumping unit for Barton-under-Needwood sewerage extension. Particulars from Willcox & Raikes, 33, Great Charles Street, Birmingham.

West Riding.—November 23rd. Education Committee. Installation of electric lighting at new Harrogate Grammar School. Particulars from the education officer, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Australia.—NEW SOUTH WALES. — Government Railways. Accepted. 2,500-kW alternator (£3,443).—Australian G.E.C.

VICTORIA.—State Electricity Commission. Accepted. Switchgear for Belmont sub-station (£2,612).—Metro-Vickers Aust. Pty., Ltd.—*Tenders.*

Dundee.—Transport Committee. Accepted. Switchgear for the sub-station to be erected in new depôt (£274).—George Ellison.

Durham.—County Council. Accepted. Reconditioning of the X-ray apparatus at the Seaham Hall Sanatorium.—Schall & Son. Wireless installation at the Seaham Hall Sanatorium.—Gramophone Co., Ltd.

Glasgow.—Corporation Electricity Committee. Accepted. Plant and appliances required in connection with the change of frequency under the Central Scotland Scheme.—Spares for rotary convertors and new motors.—Metropolitan-Vickers (£609); English Electric Co., Ltd. (£270). Spares for rotary and motor convertors (£207).—Bruce, Peebles & Co. Spares for rotary convertors.—Mather & Platt (£129); G.E.C. (£43); Harland Engineering Co. (£330). Four motors rewound and new welding plant (£108).—Beckett & Anderson. Current meters reconditioned.—Metropolitan-Vickers, Edison-Swan, Ferranti, and Chamberlain & Hookham.

Grimsby.—Electricity Committee. Recommended. Switchgear (£1,635).—Metropolitan-Vickers. Two 1,000-kW transformers (£680).—Crompton Parkinson.

Manchester.—Electricity Committee. Accepted. Low-pressure pipework, etc., at Barton power station.—John Thompson (Wolverhampton), Ltd. Town Hall Extension Sub-Committee. Accepted. Lifts at the new reference library.—Etchells, Congden & Muir, Ltd.

Northumberland.—County Council. Accepted. Electrical plant and other equipment for the Hare Crag Quarry (£13,964).—Stothert & Pitt, Ltd.

Rotherham.—Rural District Council. Accepted. Installation of electric lighting at twenty-seven houses at Bramley (£98).—F. L. Smith.

West Riding.—County Assistance Committee. Accepted. Replacement of electricity mains at Batley institution (£1,059).—Ward & Co. (Dewsbury), Ltd.

Forthcoming Events

Cardiff Engineering Exhibition.—November 18th-28th. Greyfriars Hall, Cardiff.

British Electrical Development Association.—Friday, November 20th. City of London Electric Restaurant, E.C. 7.30 p.m. Salesmanship conference. "Looking Forward." Mr. A. P. M. Fleming.

Manchester Electro-Harmonic Society.—Friday, November 20th. Waldorf Hotel, Manchester. 7 p.m. Smoking concert.

Physical Society.—Friday, November 20th. Imperial College of Science, S.W. 5 p.m. Short papers.

Birmingham Electric Club.—Friday, November 20th. Grand Hotel, Birmingham. 7 p.m. "Electric Welding Developments, Present and Future." Mr. C. A. Hadley.

Institution of Electrical Engineers.—Monday, November 23rd. Institution, London. 7 p.m. Informal meeting. Discussion on "The Electrical Heating of Buildings." Opened by Mr. R. Grierson. (*North-Eastern Students Section*).—November 20th. Tilleys' Grand Assembly Rooms, Newcastle-upon-Tyne. 8 p.m. Dance. (*North-Eastern Centre*).—Monday, November 23rd. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "The Design of a Distribution System in a Rural Area." Messrs. E. W. Dickinson and H. W. Grimmitt. (*South Midland Centre*).—Monday, November 23rd. The University, Birmingham. 7 p.m. "Coil Ignition Systems." Mr. E. A. Watson. Friday, November 27th. Grand Hotel, Birmingham. 6.30 for 7 p.m. Annual dinner. (*Scottish Centre*).—Tuesday, November 24th. Grosvenor Restaurant, Glasgow. 6.30 for 7 p.m. Annual dinner. (*South Midland Students' Section*).—Tuesday, November 24th. The University, Birmingham. 7 p.m. "Operation and Maintenance of Marine Electrical Machinery." Mr. D. M. Cathcart. (*North Midland Centre*).—Tuesday, November 24th. Hotel Metropole, Leeds. 7 p.m. "Recent Progress in Large Transformers." Mr. R. M. Charley. (*North-Western Centre*).—Tuesday, November 24th. Engineers' Club, Manchester. 7 p.m. "The Design of a Distribution System in a Rural Area." Messrs. E. W. Dickinson and H. W. Grimmitt. (*London Students' Section*).—Tuesday, November 24th. Institution, London. 6.15 p.m. "The Recording and Reproduction of Talking Pictures." Mr. H. S. Hind. (*North Midland Students' Section*).—Saturday, November 28th. 2.30 p.m. Visit to Kirkstall power station, Leeds.

Electrical Association for Women.—Monday, November 23rd. Institution of Electrical Engineers, London. 6.15 p.m. "The Healing Effects of Electric Rays." Dr. Elizabeth Sloan Chesser.

Faraday Illumination Design Course.—Monday, November 23rd. E.L.M.A. Lighting Service Bureau, London. 7.30 p.m. "Architectural Lighting as Applied to Cinemas, Hotels and Public Buildings." Mr. R. W. Maitland.

Electrical Power Engineers' Association (*London Local Group*).—Tuesday, November 24th. Junior Institution of Engineers, London. 7.15 p.m. "The Inspection and Overhaul of Steam Turbines." Mr. F. C. Callis.

Royal Society of Arts.—Wednesday, November 25th. John Street, Adelphi, W.C. 8 p.m. "Duplex Therapy and other Electro-Medical Applications." Mr. G. G. Blake.

Junior Institution of Engineers.—Friday, November 27th. Institution, London. 7.30 p.m. "Progress in the Design and Construction of Static Transformers." Mr. D. W. McJannet.

Diesel Engine Users' Association.—Friday, November 27th. Caxton Hall, Westminster, S.W. 3.30 p.m. "Notes on the Overseas Operation of Stationary Heavy-Oil Engines." By Mr. H. V. Stead; to be read by Mr. J. L. Chaloner.

Electrical Trades Commercial Travellers' Association.—Friday, November 27th. Criterion Restaurant, W. 7 for 7.30 p.m. Dinner-dance.

Royal Institution.—Friday, November 27th. Institution, London. 9 p.m. "The Work of Sir Charles Parsons." Sir Alfred Ewing.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

CROMMOID switchplates.

GILLESPIE RAYMAX oven lights.

Notes

Boiler Scale Prevention

It needs but ⅛ in. of scale in a boiler to decrease its steaming efficiency by 25 per cent. One crude method of overcoming the scale difficulty is to lay off the boiler for a time and chip away the scale by manual labour, but a cheaper, quicker, and more efficient method is to remove it by adding a scale-solvent, in most cases a chemical compound, to the feed water. According to *Municipal Engineering*, the widow of the inventor of the Mayer boiler fluid has recently resumed its manufacture. This purely vegetable preparation was formerly used by leading railway companies and steamship lines, and by many large manufacturers at home and abroad, one home concern having used it continuously for more than twenty years. It is claimed that, being a purely vegetable non-corrosive preparation, the Mayer fluid does not injure the boiler or its fittings, while by its action it rapidly reduces all scale to a fine powder, which can be periodically blown off through the sludge cock. The manufacturers are the Mayer Boiler Fluid Co., 147, Waterloo Road, Wolverhampton.

The Rugby Engineering Society

Included in the list of papers to be read before the Rugby Engineering Society during the present session are the following:—December 16th: "Individual Electric Drives," by Mr. D. Milner; January 27th: "Cable Making," by Mr. W. Lang; April 13th: "The Reorganisation of British Industry," by H. Quigley.

New Gramophone Recording Studios

The new "H.M.V." recording studios of the Gramophone Co., Ltd., at St. John's Wood, N.W., were inaugurated on November 12th, when Sir Edward Elgar, Master of the King's Musick, conducted the London Symphony Orchestra for the recording of his "Falstaff" suite. These studios, which have been built and equipped at a cost of £100,000, are among the most up to date in the world. There are three of them, in order to accommodate the different categories of music which have to be recorded from day to day. The medium and large studios have formidable stages, the latter having a platform to accommodate 250 musicians, while the auditorium will accommodate 1,000 people. This studio is nearly as large as the Queen's Hall, and considerably larger than the Kingsway Hall, and consists of 200,000 cu. ft. of space. The walls are specially designed to give correct resonance to all sounds, and to avoid any echo. A system of air cleaning and ventilation has been installed, and just over four and a half miles of electric cable connect the three studios with the central control room. Six microphones can be used at any one time in each studio, and each microphone has a separate control. There are waiting and retiring rooms for artistes, and special departments for the scientific maintenance of the whole installation. The testing equipment includes a valve oscillator and amplifier that injects notes of various frequencies into the studios by means of a loud speaker, which are then picked up by microphone and conveyed to a cathode-ray oscillograph which actually shows visibly the reverberation and the rate at which it dies down. A set of motor-generators and accumulators provides the various voltages and currents needed for the valve amplifiers and other instruments.

Generation of Electricity in October

The official returns rendered to the Electricity Commissioners show that 1,035 million kWh was generated by authorised undertakers in Great Britain during the month of October, 1931, as compared with the finally revised figure of 967 million kWh in the corresponding month of 1930, or an increase of 7 per cent.

During the first ten months of 1931, up to the end of October, the total amount of electricity generated by authorised undertakers was 9,083 million kWh, as compared with the finally revised figure of 8,729 million kWh for the corresponding period of 1930, representing an increase of 4 per cent.

The Batti-Wallahs

Sir Hugo Hirst, Bart., is to address the luncheon of the Batti-Wallah's Society to be held at the Hotel Metropole on Wednesday, December 2nd.

Appointments Vacant

Electrical traction engineer for the South Indian Railway Co., Ltd.

Lady demonstrator for Southampton Electricity Department.

Resident electrical engineer for Tanfield Urban District Council.

Assistant mains engineer for Blackburn Electricity Department.

Lady demonstrator for Long Eaton Electricity Department.

Draughtsman for Warrington Electricity Department.

(See our advertisement pages to-day.)

The Royal Institution

The programme of the Royal Institution lectures before Christmas includes, amongst Friday evening discourses, "The Work of Sir Charles Parsons," by Sir Alfred Ewing, on November 27th, and "The Optics of Electrons," by Mr. G. P. Thomson, on December 4th. The courses of afternoon lectures will include "The Combustion of Gases in Electric Discharges," by Mr. G. Ingle Finch, which will be given on November 3rd and 10th. The six juvenile Christmas lectures, which commence on December 29th, will be given by Sir William Bragg, his subject being "The Universe of Light."

The New Dunston Plant

About 70 representatives of the electrical industry from all parts of the country visited the Heaton works of Messrs. C. A. Parsons & Co., Ltd., last Friday to examine the three 50,000-kW turbo-alternator units now under construction for the Newcastle-upon-Tyne Electric Supply Co., Ltd. These were described on p. 736 of our last issue. The visitors were conducted round the works by directors of the company, after which they adjourned to the Old Assembly Rooms, Newcastle, for lunch.

During the lunch Mr. G. Bedford, managing director, received a telegram announcing that an associate firm, Sir Howard Grubb, Parsons & Co., had received an order for the dome of the giant telescope which they had built for a Toronto firm. He said the three turbo-alternator units which those present had seen were the last orders to which the late Sir Charles Parsons had been able to give his personal attention.

Floodlighting the Royal Academy

A proposal to floodlight the whole of the interior of the Royal Academy is being considered by the Academy authorities in connection with the exhibition of French art which is to be held next January. Preliminary experiments have proved so successful that it is considered almost certain that the scheme will be carried out.

Research on Illuminating Engineering Equipment

Research on the heating of cables connected to holders containing gasfilled lamps is in progress at the laboratories of the British Electrical and Allied Industries Research Association. The experiments are being directed by a sub-committee of the Association under the chairmanship of Mr. C. C. Paterson, and including representatives of manufacturers, cable makers, supply authorities, and electrical contractors. It is clear already that the results will give the industry very distinct guidance as to the causes of the heating and some ways in which it is possible to mitigate the trouble. Owing to the higher operating temperature of the gasfilled lamp, the rubber insulation of the connecting leads often becomes brittle and hard and eventually cracks, creating short-circuit risks. In the I.E.E. Regulations for the Electrical Equipment of Buildings it is recommended that the working temperature of cables should not exceed 50° C. for continuous operation. In some fittings this temperature may reach over 100° C., and deterioration is then comparatively rapid.

Comprehensive tests on representative fittings used for domestic, shop, office, and factory lighting show that the temperature depends on a number of variables, among the most important of which are the effect of the design of the fitting on the dissipation of heat, the amount of heat flowing through the cap of the lamp to the holder, and the temperature of the hot air in the convection currents rising from the lamp. Apparatus has been developed which enables these convection currents to be shown on a screen or photographed, and a number of methods are now being studied to ascertain the best means of keeping the temperature down.

Marine Depth Sounders

About eighty Fleetwood fishing vessels are being fitted with Marconi automatic depth sounders, their installation being completed at the rate of one a day. The instrument indicates instantaneously, irrespective of the speed of the trawler or weather conditions, all depths between 2 and 360 fathoms under the keel, making sixty distinct recordings every seventy seconds, no matter how quickly the ocean bed changes. It also enables the skipper to ascertain to some extent the nature of the sea floor.

A Faraday Memorial

In a letter to *The Times*, Mr. Paul Faraday refers to the memorial costing £2,000,000 that is being planned in honour of Edison. He has suggested purchasing the house in Blandford Street at which Faraday was apprenticed and converting it into a museum as a memorial of him.

"Surely," he says, "it is not impossible to raise a fraction of the cost of the proposed memorial to Edison in order to honour Faraday's name. My suggestion was that the museum should contain relics of Faraday. May I make another suggestion? It is that the museum should illustrate the history of lighting, in view of Faraday's close connection with oil and gas lighting, and later with the foundations of electric lighting. If this idea should find favour I am willing to give the whole or part of my collection of old lamps (which is, I believe, the largest in Great Britain), to such a museum.

"In conclusion may I say that I should be glad to hear from those who are in sympathy with this suggested memorial to Michael Faraday, and especially from those who are in a position to form a committee to raise the modest funds necessary."

Röntgen Society's Dinner

The annual dinner of the British Institute of Radiology (Röntgen Society) will be held on December 4th at the Trocadero Restaurant, Piccadilly Circus, W.1, at 7.30 p.m.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

In referring, in our issue of October 28th, to the retirement of **Mr. C. W. O. Rochs** from the position of chief of traffic production to Imperial and International Communications, Ltd., it was incorrectly stated that Mr. Rochs was appointed to that post " when Marconi's Wireless Telegraph Co., Ltd., for which he was traffic manager, was *merged* in the I. and I.C." The fact is that the Marconi Company only disposed of its telegraph communication services to Imperial and International Communications, Ltd.; its main activities as a manufacturing, licensing, and general wireless business, with world-wide connections, remain unchanged.

Mr. Alfred J. Dalton, of the A. J. Dalton Electrical Service, Dorchester, has been elected a member of the Dorchester Town Council. Mr. Dalton commenced his career as an apprentice to the Weymouth Corporation Electricity Department, and in 1913 he joined the Newcastle-upon-Tyne Electric Supply Co., Ltd. He remained in Newcastle until 1922 when he returned to the South of England and commenced contracting, later being joined in partnership by Mr. R. Sefton Smith.

Mr. C. R. D. Pritchett, who was recently appointed chairman of the National & Tudor Accumulator Companies

Mr. C. R. D. Pritchett, whose appointment as chairman of the National Accumulator Co., Ltd., and of the Tudor Accumulator Co., Ltd., was reported in our issue of November 6th, received his electrical training at Faraday House, and as a pupil with Plenty & Sons, and the Electric Construction Co., Ltd. He was appointed assistant engineer to the Woolwich Electric Light Co., and later became assistant engineer to the St. James' and Pall Mall Electric Light Co., Ltd. In 1897 he joined the firm of Pritchett & Gold and in 1901 became joint managing director of Pritchett and Gold, Ltd., which position he continued to hold when the Electrical Power Storage Co., Ltd., was acquired in 1915, and the name of the company was changed to Pritchett & Gold and Electrical Power Storage Co., Ltd. Since then the company has taken over the business of the New Peto and Radford Accumulator Co., Ltd., and the Premier Accumulator Co. The change of the title of the company to its present form was effected in 1921.

Dr. L. G. H. Huxley, who has carried out radio and other research work in Australia, under the auspices of the Council for Scientific and Industrial Research and the Radio Research Board, has, according to the *Australian Electrical Times*, returned to England to take up work at the University of Nottingham.

Ald. Sir Percival Bower has been elected chairman of the Birmingham Electric Supply Committee, in succession to Councillor H. K. Beale. Mr. Beale was chairman of the Electric Supply Committee for eleven years.

Mr. Richard Breerton, sales manager of the mechanical department of Redfern's Rubber Works, Ltd., has been re-elected to the Hyde Town Council.

Mr. Hamlyn M. Drake has been appointed chairman of the D.P. Battery Co., Ltd., in succession to his father, the late Mr. B. M. Drake.

Mr. J. L. Baird, the inventor of the television system bearing his name, was married in New York on November 13th to Miss Margaret Albu.

Lord Ashfield has accepted an invitation to become a member of a Commission which has been appointed to investigate the railway transport systems in Canada, and was to leave for Canada this week.

Mr. E. A. Boxall has joined the outside staff of the Henderson Wireless and Electrical Service, and will represent the company in Kent, East Sussex, Hampshire, and Surrey.

Mr. Theodor K. Cordes, formerly manager of the instrument and wireless works of Messrs. Johnson & Phillips, Ltd., has taken up an executive appointment with Messrs. A. C. Cossor, Ltd.

At the annual meeting of the Junior Institution of Engineers held on November 13th, **Mr. J. Foster Petree** was elected chairman, and **Mr. E. Ambrose** and **Mr. H. P. Wright** were elected vice-chairmen.

Dr. C. G. Lamb has been reappointed Reader in Electrical Engineering for six years at Cambridge University.

The following awards for the 1930-31 session have been made by the Junior Institution of Engineers:—Institution Gold Medal to **Mr. L. Clegg** for his paper on " Synthetic Resins "; the Tookey Award to **Mr. T. H. Flowers** for his paper on " The London Automatic Telephone System "; and the Sheffield and District Section Silver Medal to **Mr. C. F. Adams** for a paper on " The Electrical Equipment of Railway Rolling Stock."

Mr. W. R. Bullimore, managing director of A. C. Cossor, Ltd., has been elected chairman of the British Radio Valve Manufacturers' Association for the ensuing year. **Mr. W. Witt,** of the Edison Swan Electric Co., Ltd., has been appointed vice-chairman and chairman of the Management Committee.

Mr. C. St. J. Murphy, until recently sales manager of the Nottingham branch of Philips Lamps, Ltd., has been appointed manager of the Birmingham branch of the Franco-British Electrical Co., Ltd.

Mr. T. B. Goodyer, formerly general manager of the Croydon Corporation tramways, was prevented by an attack of influenza from being present at the funeral of the late Mr. A. H. Walton.

Mr. F. R. Plowman, of the English Electric Co., Ltd., has arrived in South Africa to take charge of the electrical contract work for the company at the new steel works at Pretoria. Mr. Plowman has been for four and a half years in charge of the railway electrification in connection with the new Sydney Harbour bridge, and went direct from Australia to South Africa.

Obituary

Mr. A. H. Walton.—The remains of Mr. Alfred Henry Walton, whose death was announced in our last issue, were interred at Highgate Cemetery on Friday, November 13th. (Mr. Walton was, we learn, 69 years of age, not 71 as stated last week in our brief record of his career.) In addition to members of the family, there were many gentlemen present representing the electrical and engineering professions and industries, and a number of members of the Brownswood Bowling Club, as follows:—

Mrs. A. H. Walton (widow), Miss D. K. Walton (daughter), Mrs. J. A. Kydd (daughter), Mr. J. A. Kydd (son-in-law), Miss G. Walton, and Messrs. F. Walton, J. Walton, and P. Birchall.

Representing the B.T.H. Co., Ltd., were:—Messrs. W. C. Lusk, chairman (also deputy-chairman of Associated Electrical Industries), H. N. Sporborg, director and chief engineer, F. Fraser, director and secretary, J. L. Wilson, sales director, and H. A. Lingard, director. Also Messrs. A. Clements, assistant secretary, E. P. Morris (representing Mr. Woodworth), P. F. Lloyd, C. B. Kingsford, F. Samuelson, F. Clough, F. Stoneham, G. E. Riley, W. J. Belsey, J. E. Betts, W. J. Cusack, R. H. Simpson, J. M. Simpson, A. Willis, A. B. Bowater, J. S. Ramsden and C. Collins. *Crown House* staff was represented by Messrs. A. W. Jones, J. W. Leach, S. Rowland, W. E. Butcher, E. M. Swift, W. H. Russell, J. Poett, Captain Trippe, F. E. Winterbourne, and the Misses Garner, Lake and Billings.

Others present included:—Messrs. F. W. Leevers and P. Kelly (Edison Swan Co.); P. S. Turner and A. S. Rinder (sales director and London manager respectively of the Metropolitan-Vickers Co.); F. J. Walker (St. James' and Pall Mall E.L. Co.); Dr. S. L. Pearce (London Power Co.); H. Kolle (Babcock and Wilcox); A. R. Bacon (County Co.); G. Summers (Stirling Boiler Co.); C. J. Spencer, A. V. Mason, W. A. Agnew, and J. P. Thomas (London Electric Railways); H. P. Gaze and M. Feetham (London Power Co.); Captain Balfour Clark (B.E.A.M.A., representing Mr. Dunlop); T. Trimnell; O. Baldwin; A. M. Sillar; C. W. Hill; P. V. McMahon; P. E. Banting; H. P. Rowles and H. P. Chapman (Metropolitan Electric Supply Co); Captain Sparks; T. Bryan (Reyrolle's); T. Stevens; H. P. Lawson (Hick, Hargreaves); J. E. Elliott (Worthington-Simpson); G. D. Stone (Mirrlees-Watson); W. T. Terry (London Electric Wire Co.); B. Leigh (Metropolitan-Vickers); and C. Lucas (Brush Co.).

The Brownswood Bowling Club (of which Mr. Walton was elected vice-president two days before his death, the letter of notification being read to him on the morning of his passing), was represented by Messrs. F. J. Nield, A. Handyside, J. H. Beech, S. F. Shears, T. Holmes and F. Elstob.

The wreaths and floral tributes numbered between seventy and eighty; among them was a little wreath of roses " from Helene and Brian to our darling Grandpa."

Dr. L. T. Robinson.—We regret to learn of the recent sudden death of Dr. L. T. Robinson, of the General Electric Company, Schenectady. He was a prominent member of the Advisory Committee on the Rating of Electrical Machinery, of the International Electrotechnical Commission.

Mr. E. J. Skinner.—The death is reported, as the result of an accident, of Mr. E. J. Skinner, resident engineer of the electricity works, Totnes, owned by the Electric Supply Corporation, Ltd. Mr. Skinner was 46 years of age.

Will.—Mr. Arthur Wright, who introduced the maximum demand system of charging for electricity and was Brighton's first electrical engineer, left £38,562 (net personalty £38,292).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Britannia Electric Lamp Works, Ltd.—Private company. Registered November 10th. Capital, £15,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of electric incandescent lamps, electrical accessories, etc. The directors are: B. Sacov, L. Joseph, and D. Joseph, all of 46, Forburg Road, Stoke Newington, N.16; J. de Nolf, Rue du Sud 5, Roulers, Belgium; M. Delcourte, 251, Chaussée de Terlemont, Kessel Loo les Louvain, Brussels; and F. Delbeke, 12, Rue du Bastion, Anvers, Belgium. The directors may borrow up to £50,000. Registered office: Chase Estate, Park Royal Road, N.W.10.

Claude B. Barton, Ltd.—Private company. Registered November 12th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless and television apparatus, electrical fittings, etc. The directors are: C. B. Barton and Mrs. B. G. Barton, 28, Leversal Avenue, Lenton Sands, Nottingham.

Direct Sales, Ltd.—Private company. Registered November 11th. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, manufacturers of generators, accumulators, radio sets, etc. The permanent directors are: B. Glassman and Annette H. Glassman. Solicitors: Elwell & Binford Hole, 65, Coleman Street, E.C.

Thorpe & Thorpe, Ltd.—Private company. Registered November 12th. Capital, £5,000 in 3,000 ordinary and 2,000 redeemable non-cumulative 7 per cent. preference shares of £1 each. Objects: To acquire the business of Thorpe & Thorpe, Ltd. (in voluntary liquidation), and to carry on the business of electrical engineers, engineers' agents, etc. The directors are: M. C. Jones, Threshers Dean, Headley, Surrey; D. W. Thorpe, Black Firs, Chalfont St. Giles, Bucks; and R. G. Sullivan, 16, Fairmile Avenue, Streatham, S.W.16. Solicitors: Farrer & Co., 66, Lincoln's Inn Fields, W.C.2.

Electroway Heaters, Ltd.—Private company. Registered November 9th. Capital, £2.000 in £1 shares. Objects: To carry on the business of electricians, electrical and mechanical engineers, manufacturers of and dealers in electric tubular heaters, electric fires, and other electrical appliances. The directors are: J. W. Wells, "Saxelby," Outwoods Drive, Loughborough; F. Sedgwick, 85, Toothill Road, Loughborough; and A. S. Young, 107, Albert Promenade, Loughborough. Secretary: C. E. Bream. Registered office: 38, Baxter Gate, Loughborough, Leicestershire.

J. Evans & Co., Ltd.—Private company. Registered November 7th. Capital, £1,200 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in lampshades of all kinds, electrical fittings, accessories and instruments, wireless sets and accessories, etc. The subscribers are: P. F. Hedges, The Briars, Southend Road, Hockley, Essex, managing clerk; V. G. Wilson, 1, Bush Lane, E.C.4, clerk. The first directors are not named. Solicitors: Stafford Clark & Co., 1, Bush Lane, E.C.4.

I.V.C. Company, Ltd.—Private company. Registered November 5th. Capital, £6,000 in 20,000 ordinary shares of 1s. each and 20,000 10 per cent. participating preference shares of 5s. each. Objects: To carry on the business of manufacturers and factors of and dealers in electrical and other vacuum cleaners, refrigerators, electrical heaters, electrical and fancy goods, etc. The subscribers are: G. White, 124, Minories, E.C.3, electrical engineer, and E. Lewis, 124, Minories, E.C.3, engineer. The first directors are: A. Schmidt, E. H. Charsley, of Bridge House, Bexley Heath, and F. W. Paterson.

Accumulator Service, Ltd.—Private company. Registered November 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, manufacturers of and dealers in wireless apparatus, accumulators, etc. The directors are: W. R. Morley, 86, Lind Road, Sutton, Surrey, and F. Foster, 16, Marshall's Road, Sutton, Surrey. Registered office: 86, Lind Road, Sutton.

Read Radio (1931), Ltd.—Private company. Registered November 16th. Capital £2,000 in £1 shares. Objects:—To develop and turn to account and trade with inventions relating to wireless telegraphy and telephony, the radio control of clocks, and other apparatus, the construction, operation and control of electrical signs and other like devices, time recording, or any other inventions, etc. The subscribers are:—E. Rudland and J. Cookson, both of 2, Bond Court, Walbrook, E.C.4. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.4.

Midland Metropolitan Electric Co., Ltd.—Private company. Registered November 13th. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers, vendors and agents for the supply of electrical goods and apparatus, lamp shades and reflectors, and wireless instruments, etc. The subscribers are:—S. Jarrett and L. Kransky, both of 17, Shaftesbury Avenue, W.1. The first directors are to be appointed by the subscribers. Solicitors: Stanley Jarrett & Co., 17, Shaftesbury Avenue, W.1.

C. H. Booth, Ltd.—Private company. Registered November 14th. Capital £1,000 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in all kinds of goods and apparatus for use in connection with the generation, distribution, and accumulation of electricity, and in the wireless, telephone and television businesses, etc. The directors are:—C. H. Booth, 25, Station Road, Erdington, Birmingham; and J. S. Myatt, 28, Kedlestone Road, Hall Green, Birmingham. Registered office: 19, Staniforth Street, Corporation Street, Birmingham.

Sign Accessories Co., Ltd.—Private company. Registered November 16th. Capital £100 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in all kinds of electrical apparatus, vacuum discharge tubes, electric lamps, fittings, etc. The directors are:—R. G. McLeod, 17, Southampton Street, W.C.1; and H. A. Steward, 422, Whitehorse Road, Thornton Heath. Registered office: 17, Southampton Street, W.C.1.

Hall Motor Repairs, Ltd.—Private company. Registered November 13th. Capital £4,000 in £1 shares (2,000 5 per cent. cumulative preference and 2,000 ordinary). Objects:—To acquire part of the undertaking of J. P. Hall & Co., Ltd., and to carry on the business of repairers of electric motors, dynamos and equipment, general and electrical engineers, etc. The subscribers are:—A. W. Butterworth, 214, Frederick Street, Oldham; A. Dobson, 44, Eastbourne Street, Oldham; and G. Smith, 96, Eaves Lane, Chadderton. Solicitors: Warren, Murton, Miller and Foster, 45, Bloomsbury Square, W.C.1.

Asbestos and Engineering Products, Ltd.—Private company. Registered November 14th. Capital £1,000 in £1 shares. Objects:—To carry on the business of merchants, agents, general importers and exporters, electrical, motor and mechanical engineers, minerals, etc. H. W. Barnes, Winchester House, E.C.2, is permanent governing director. Solicitors: C. R. Enever & Co., Broad Street House, E.C.2.

Returns of Electrical Companies

Brush Electrical Engineering Co., Ltd.—Capital, £600,000 in £476,401 ordinary stock and 29,663,760 ordinary shares of 1d. each. Return dated May 25th, 1931. £476.401 ordinary stock and 2,910,190 ordinary shares taken up. £327,348 0s. 10d. paid on £315,226 ordinary stock and 2,910,190 ordinary shares, leaving £3 15s. calls in arrears. £161,175 considered as paid on £161,175 ordinary stock. Mortgages and charges: £173,423.

Altrincham Electric Supply, Ltd.—Capital, £210.000 in 49,650 first preference, 103.350 second preference, and 50,000 ordinary shares of £1 and 140,000 deferred shares of 1s. each. Return dated April 29th (filed May 18th), 1931. 45,000 first preference, 63,350 second preference, 50,000 ordinary, and 140.000 deferred shares taken up. £105,350 paid on 45,000 first preference, 10,000 second preference, 50,000 ordinary, and 7,000 deferred shares. £60,000 considered as paid on 53,350 second preference and 133,000 deferred shares. Mortgages and charges: £182,916 13s. 4d.

Boston and District Electric Supply Co., Ltd.—Capital, £120,000 in £1 shares. Return dated June 4th, 1931. All shares taken up. £120,000 paid. Mortgages and charges, nil.

Key Engineering Co., Ltd.—Capital, £5,000 in 4,993 ordinary and seven deferred shares of £1. Return dated April 2nd (filed October 22nd), 1931. 4,070 ordinary and seven deferred shares taken up. £4,077 paid. Mortgages and charges £5,000.

Flexible Lamps, Ltd.—Capital, £5,000 in £1 shares. Return dated June 10th, 1931. 2,750 shares taken up. £1,800 paid (being 16s. per share on 2,250 shares). £500 considered as paid on 500 shares. Mortgages and charges, nil.

British Home and Office Telephone Co., Ltd.—Capital, £10,000 in £1 shares. Return dated September 18th, 1931. 5,230 shares taken up. £5,230 paid. Mortgage and charges, nil.

Full Light Safety Lamps, Ltd. (formerly Full Light Anti-Dazzle Lamp (Parent), Ltd.).—P. Mordant, of 115-117, Cannon Street, E.C.4, ceased to act as receiver and manager on November 3rd.

Wolf & Morgan, Ltd. (formerly Wagner Electric Supplies, Ltd.).—F. W. Morgan, of 66, Victoria Street, S.W.1, was appointed receiver and manager on October 29th, under powers contained in first debentures dated October 23rd, 1929.

Walter Phillips (Acorington), Ltd.—Particulars filed of £3,000 debentures authorised October 21st, charged on the company's undertaking and property, including uncalled or unissued capital, the whole amount being now issued.

South Metropolitan Electric Light and Power Co., Ltd.—Satisfaction (*a*) to the extent of £304,834 on or before July 1st, 1931, of debentures, particulars of the issue of which were registered on various dates from February 19th, 1902, to March 7th, 1921, and (*b*) of supplement trust deed dated June 3rd, 1904, and registered June 16th, 1904.

Electrical Finance & Securities Co., Ltd.—Satisfaction to the extent of £2,970, on October 31st, of trust deeds dated July 29th, 1927, July 6th, 1928, and April 24th, 1930, to secure debenture stock authorised by resolutions of directors, dated April 28th, 1927, May 3rd, 1928, and March 6th, 1930, and of the company dated May 6th, 1927, and registered July 29th, 1927, July 10th, 1928, and April 29th, 1930.

Flexible Electric Cords, Ltd.—F. Kniveton, 7b, London Road, Enfield, ceased to act as receiver and manager on November 9th.

Thomas F. Farrimond & Sons, Ltd.—H. J. Herbert, of 40/42, Oxford Street, W.1, was appointed receiver and manager on January 20th, 1931, under powers contained in instrument dated May 11th, 1929. (Notice filed November 6th, 1931.)

Mid-Cheshire Electricity Supply Co., Ltd. (formerly Northwich Electric Supply Co., Ltd.).—Satisfaction to the extent of £18,250 on October 1st, 1931, of 6 per cent. mortgage debentures dated March 3rd, 1921, as to £15,000 and October 31st, 1924, as to £3,250 and registered May 9th, 1921, and October 31st, 1924.

British Horo-Electric, Ltd.—Satisfaction in full on July 29th, 1931, of debenture dated May 2nd, 1927, and agreement as to further advance dated December 6th, 1929, and registered May 10th, 1927, and December 12th, 1929, respectively. (According to the register of mortgages, the debenture registered May 10th, 1927, originally secured £2,000 and the agreement registered December 12th, 1929, originally secured £1,000.)

City Notes

The Perak River Hydro-Electric Power Co., Ltd., in its report for the year ended July 31st last, states that the revenue amounted to £195,033, from which is deducted Malayan expenses totalling £81,519, leaving a gross surplus of £113,514. After adding interest and other receipts (£2,210) and deducting administrative expenses, interest and other charges, there is a balance of £2,358, which is carried forward. The interest accrued under the moratorium on the loan from the Federated Malay States Government and on the participating debenture stock (£137,000) has been transferred to interest suspense account. The report states that the restriction of output in the tin industry prevented any expansion in the company's business, but the sales of power were maintained during the year.

The Cape Electric Tramways, Ltd., reports a working profit of £34,269 for the year ended June 30th last, as compared with £39,092 in the preceding year. After deducting debenture interest (£4,794), premium to be paid on debentures redeemable (£426), and providing for depreciation on the subsidiary companies' assets (£21,148), there was a net profit of £7,901, to which is added £46,631 brought in, making £54,532. A sum of £14,200 has been set aside to provide for the debentures redeemable on July 1st, and the balance of £40,332 is carried forward. The number of passengers carried by the tramways in Cape Town and Port Elizabeth decreased from 27,467,145 to 24,764,835.

The Canadian Hydro-Electric Corporation, Ltd., has announced the regular quarterly dividend of $1.50 per share on the 6 per cent. cumulative first preferred stock. For the twelve months ended August 31st the consolidated net revenue available for dividends was $2,032,997, or $16.26 per share on the 6 per cent. cumulative first preferred stock, as compared with $1,655,303, or $13.24 per share, in the preceding year. Net revenue added to surplus was $1,282,997, or 42 per cent. greater than in 1929-30.

The East India Tramways Co., Ltd., reports gross receipts for the year ended July 31st of £53,413, as compared with £51,720 in the preceding year. Expenses amounted to £37,410 (against £35,580), leaving £16,003, to which is added £716 brought in, making £16,719 available. It is proposed to set aside £1,000 for reserve, £3,000 for income tax, and to pay a dividend of 10 per cent., tax free, on the deferred shares, leaving £674 to be carried forward.

The Rushden and District Electric Supply Co., Ltd., proposes to increase its capital to £100,000 by the creation of 25,000 additional shares of £1 each. The resolution is to be submitted at an extraordinary general meeting to be held in Northampton on November 24th.

Dorman, Long & Co., Ltd., have decided not to recommend a dividend on the 6 per cent. cumulative preference shares for the year ended September 30th. A dividend was paid on these shares last year, but no distribution has been made on the preferred shares since 1923-24.

The Melbourne Electric Supply Co., Ltd., has declared a final dividend on the consolidated ordinary stock of 3¾ per cent., tax free, making 7½ per cent., tax free, for the year, against 10 per cent., tax free, in the preceding year.

The Chloride Electrical Storage Co., Ltd., has announced an interim dividend of 5 per cent. on the "A" and "B" ordinary shares (same). The ordinary capital was doubled in 1930 by a bonus issue of 100 per cent.

The Central Electricity Board has placed privately a further £1,000,000 of 5 per cent. 1950-70 stock. Two blocks of £1,000,000 of the same stock were placed privately last month.

The Midland Counties Electric Supply Co., Ltd., has received the sanction of the shareholders to increase its capital to £5,000,000 by the creation of 500,000 £1 shares.

The Anglo-Portuguese Telephone Co. has declared an interim dividend on the ordinary shares of 3 per cent. (same).

The Tata Power Co. reports a net profit for the year ended June 30th last of Rs. 10,23,734, as compared with Rs. 9,39,559 in the preceding year, to which is added Rs. 31,714 brought forward. From this is deducted Rs. 1,784, written off investments, Rs. 97,943, the difference between book value and market value of sterling securities, Rs. 50,000 for bad and doubtful debts, and Rs. 40,000 for special repairs. A dividend of 7½ per cent. is paid for the 15 months to September 30th and Rs. 1,51,939 is carried forward.

Companies to be Struck Off the Register

The names of the undermentioned companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary:—

Atlas Electrical Co., Ltd.
Midland Wireless Manufacturing and Supply Co., Ltd.
New Standard Wireless Valve Co., Ltd.

Stocks and Shares

TUESDAY EVENING.

ON Monday in this week the Stock Exchange started again to deal for the fortnightly settlements instead of for cash. The latter arrangement has been in force for six weeks, during which time the chief event has been the General Election, with the return of the National Party to power with a huge majority. The introduction by the new Government of an anti-dumping Bill was anticipated, and, in advance of the Government's proposals now before Parliament, the prices of many industrial shares had been advanced, in some cases fairly sharply. It had been expected, too, that resumption of fortnightly accounts would lead to an inevitable accession of business in the Stock Exchange, and this had a favourable effect upon prices before the cash dealings restriction was removed. The event has shown that anticipation ran too far ahead, and, instead of business becoming more active, and buyers more prominent, the opposite turned out to be the case. A stream of profit-taking set in, and this, not being met by a fresh volume of support, served to cast an air of dullness over Stock Exchange markets as a whole. The heaviness was accentuated by the crises between France and Germany and between China and Japan. The net result is that business in the Stock Exchange markets is quiet, although the impression prevails that the "Buy British" slogan of the present week may have a practical effect upon expanding business amongst home manufacturers.

Home Electricity Shares

The increase in the number of units of electricity generated in Great Britain during the past month makes cheerful reading, and is used as an argument in favour of the impression that the supply of electricity is not likely to be checked through the campaign of economy inaugurated by the coming of the National Government. So far as prices of electricity supply shares are concerned, the movements are comparatively small. County of London rose to 45s. 9d. and Metropolitans to 40s. 9d. There has been some inquiry for the preference shares of the best-known companies. Newcastle-on-Tyne 7 per cent. preference, for example, are 1s. up at 26s. Improvement in fixed-interest stocks is reflected in the advance of Central Electricity and London and Home Counties debenture stocks. The prices of these have risen to the common price of 89, showing gains on the week of 1 and 1½ respectively. Midland Counties eased off to 27s. on the issue of 300,000 new ordinary shares of 24s., in the proportion of one of these to nine old ordinary. The price of the new ordinary is 1s. 9d. premium, and the rights are valued at twopence per old share.

Home Railway Stocks

The feature in the Home Railway market is the continued strength of Metropolitan consolidated. The price is again two points higher at 45½, so that the weakness which befell "Mets" upon the announcement of the London Passenger Transport Bill is being steadily wiped out. Districts are unchanged at 62½, and Underground Electric ordinary shares remain at a guinea. The Southern Railway extension of its electrification to Brighton is being pushed forward steadily. The company expects to be able to open the electric service as far as Three Bridges by July next year. Some people think that the complete service to Brighton may be ready for traffic before the end of 1932. Negotiations have already been opened by the Minister of Transport, in the new Government, with the "opposite numbers" concerned in the London Passenger Transport Bill.

Cables and Wireless

Pause has been given to the buoyancy of late displayed by the market in Cables and Wireless stocks. While the ordinary continues good at 27, the preference and the "B" ordinary stocks are both lower at 64½ and 16 respectively. There is a fair amount of speculative interest being taken in the three classes, for if the preference stock should receive its full 5½ per cent. in respect of the year 1931, which will become due in March of next year, the yield on the money at the present price will work out to 8½ per cent. Optimism still toys with the idea of a possible distribution on the "A" ordinary, though this, as mentioned on previous occasions, seems to be taking a very hopeful view of immediate prospects. Amongst the other stocks and shares in the group, Anglo-American Telegraph preferred advanced to 95. The Globe Telegraph and Trust shares maintained their previous ground. The ordinary at 10½ look fully valued in the light of the probable dividend for the company's financial year. Great Northern Telegraphs keep good at 24½. American Telephone and Telegraph at 182½ has lost 12½ of its 20 points rise of a week ago, and International Telephone and Telegraph shares at 22 are 2½ lower. Western Union Telegraph common shares have dropped 10 to 85. Canadian Marconis went back to 7s. 6d., upon issue of an unsatisfactory report.

Colonial and Foreign Stocks

The Anglo-Portuguese Telephone Company has declared a dividend of 3 per cent. less tax, payable on the Thursday in this week. This is a similar dividend to that declared a year ago. The price of the shares is now marked ex this dividend, and stands at 16s. 3d. Other dividends which have been deducted this week are 1s. 6d., less tax, on Siemens and 7 1/5d., less tax, on Clyde Valley 6 per cent. preference. Atlas ordinary at 13s. 3d. and the preference at 22s. 6d. went ex at the beginning of this week. The Melbourne Electric Supply Company has announced a final tax-free dividend on the consolidated ordinary stock, making 7½ per cent. for the year which ended August 31st last. This goes against 10 per cent. for the previous year. The price of the stock stands at 100, but no business has been marked since September 29th, when bargains were recorded at 105 and 106. The 8 per cent. first preference shares of £5 each are quoted at 4, and the 5 per cent. first mortgage debenture is 78. A decided change for the better has come over Australian issues as a whole, Government and industrial alike. The Commonwealth is getting once more upon its financial legs, and following upon rises that

range from 20 to 30 points in the prices of Australian Government stocks, there is a demand for Australian industrials of all kinds.

India and F.M.S.

Inquiry has sprung up lately, also, for Indian industrials, due, as mentioned last week, to a rise in the price of silver from 1s. per ounce to 1s. 9d. per ounce. The rise was rudely arrested early this week by a reaction to 1s. 6d. per ounce, but this has had no particular effect upon the previous strength shown by Indian electricity and transport shares. Calcutta Electric ordinary are a steady market at 37s., and Delhi Electric at 24s. Madras Electric ordinary at 22s. 6d. were ex 6d. dividend, tax free, early in the present week. The company's 5½ per cent. preferred shares, free of tax, are changing hands on the basis of 19s. 9d. The Perak River Hydro-Electric Power Company, which recently suspended interest payments on the 7 per cent. participating debentures, and placed a prior lien issue, shows in its accounts that, by the exclusion of certain interest payments accrued under the moratorium, a credit balance of £2,400 remains after meeting London charges. The price of the ordinary shares stands at about 2s. 6d., and the 7 per cent, participating debenture stock has been changing hands this week at 35 and 36. The Company's 5 per cent. debenture stock, guaranteed under the Trade Facilities Acts, remains at 99½.

Dollar Stocks

The rises which took place last week in Mexican issues have been supplemented by a further gain of 7 points in Mexican Light & Power 5 per cent. first bonds, the price of which has risen to 62. The other stocks in this group maintain their prices without further change. The fall in the price of silver has checked bullish speculation in Mexicans, at any rate for the time being. In the Brazilian group, Rio Tramway 5 per cent. first mortgage bonds at 74½ are 2 points higher. Amongst the Canadian-Americans, Shawinigans are a point down at 38, but Montreal Light & Power have risen 2½ to 50. Power Corporation of Canada at 40½ show a fall of 2 points, and Pennsylvanias are steady at 72½. Anglo-Argentine Tramways preference, of the sterling shares, hold the substantial gains which they secured last week, but the 5 per cent. debenture has reacted 3 points to 22½.

Manufacturing and Equipment Shares

The anti-dumping Bill proposed by the Government has had no particular effect upon prices in the market for electrical manufacturing and equipment shares. The movements this week are mostly in a downward direction, British Insulated having gone back to 3, English Electric ordinary to 10s., General Electrics to 46s. 3d., and Henleys to 5½xd. India Rubber shares have rallied to 6s. 9d. The demand for preference shares has extended to General Electric 6½ per cents., which at 24s. 6d. show a gain of the pence. Chloride Electric Storage A and B shares are lower at 2¾. The iron, coal and steel group is tolerably steady, Vickers remaining close to 10s. Babcocks hold their advance at 52s. 6d. The rubber share market gives no fresh sign of vitality.

Cotton as an Insulator

In a paper read by Mr. R. L. Martin, of the Engineering Laboratory of the British Thomson-Houston Co., Ltd., before the Textile Institute at Manchester on November 13th, it is explained how the electrical industry has been very dependent upon the successful use of cotton textiles, which enter more and more into the construction of motors, transformers, cables, and other apparatus. The paper is intended to provide those in the textile industry with a general idea of the extent to which cotton products are used as electrical insulating materials, details of the main purposes for which they are required, and the properties and other features affecting the successful employment of cotton goods for such purposes.

The pronounced hygroscopic nature of cotton prevents its use for insulation purposes where high electrical stresses are imposed upon it. Cotton insulation has to be protected from moisture absorption by varnishes, rubber, bitumen, etc.; it is not generally used as the primary dielectric, but functions mainly as a mechanical support and protection for other materials of better electrical properties.

The speaker outlines the work of the British Cotton Industry Research Association, the Research Department of the Bleachers' Association, and the British Electrical and Allied Industries Research Association, in collaboration with textile manufacturers, and also the work of the B.T.-H. Engineering Laboratory, and shows how the E.R.A., particularly, has encouraged and co-ordinated such work, and has developed recommended standard methods of tests on yarns and fabrics, both untreated and varnished. As a result of this work considerable improvements have been made in the cotton materials now used in the electrical industry, and the British Engineering Standards Association has been thereby enabled to issue a British Standard Specification for varnished cloth, sheet strip, and tape.

The employment of cotton products for electrical purposes is by no means decreasing, though the form in which they are produced is ever changing, so that by still further co-operation between these industries in concentrating upon these problems, developments are sure to result which will be of mutual benefit.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Nov. 17, 1931.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole		15	15	58/9	—	5 2 3
Brompton Ordinary		8½	8½	27/6	—	5 1 0
Central Electricity 4½% Deb.	Stock	—	4½	89	+1	5 1 3
Charing Cross Ordinary	1	8½	8½	29/6	—	4 14 11
Chelsea	1	8½	8½	28/–	—	5 7 8
City of London	1	10	10	35/–	—	5 14 3
Clyde Valley	1	8	8	32/6	—	4 18 6
County of London	1	11	11	45/9	+9d.	4 16 1
Edmundsons' 7% Pref.	1	7	7	24/6	—	5 14 3
Elec. Supply Corporation	1	11	11	42/6	—	5 3 6
Kensington Ordinary	1	8	8	29/–	—	4 16 7
Lancs. Light and Power	1	7	6½	25/–	—	5 4 0
London & Home Counties 4½% Deb.	Stock	—	—	89	+1½	5 1 3
London Electric	1	8½	9	32/6	—	5 10 9
Metropolitan	1	9	10	40/9	+9d.	4 18 0
Midland Counties	1	6½	7	27/0	—6d.	5 3 8
Mid. Elec. Power	1	15	8	28/9	—	5 11 3
Newcastle-on-Tyne Ordinary	1	6	6	25/–	—	4 16 0
Do. 7% Pref.	1	7	7	26/–	+1/–	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	1	8	8	29/–	—	4 16 7
Scottish Power	1	8	8	28/3	—	5 13 3
South London	1	8½	8½	25/6	—	5 9 8
Urban Ordinary	1	7	7	27/–	—	5 3 8
Westminster Ordinary	1	8½	8½	28/–	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/–	—	6 10 5
Yorkshire Elec.	1	8	8	32/6	—	4 18 6
HOME RAILS						
Central London Ord. Assented	Stock	4	4	70½	—	5 13 6
Metropolitan	,,	4	3½	45½	+2	7 13 10
Do. District	,,	5	5	62½	—	8 0 0
Underground Electric	1	8	8	21/–	—	7 12 5
TELEGRAPHS AND TELEPHONES						
Anglo-Am. Tel. Pref.	Stock	6	6	95	+½	6 6 4
Do. Def.	,,	1½	1½	23	—	6 10 5
Cables & Wireless 5½% Pref.	Stock	5½	5½	64½	—1½	—
Do. A 7½% Ord.	,,	Nil	—	27	+½	—
Do. B Ord.	,,	Nil	—	16	—1	—
Globe Tel. and T. Ord.	10	10	8½	10½	—	—
Do. do. Pref.	10	6	6	9½	—	6 13 4
Great Northern Tel.	10	20	20	24½	—	8 3 4
Marconi-Marine	1	15	15	36/3	—	8 5 6
Oriental Telephone Ord.	1	12	12	2½	—	*5 13 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	5½	—	15/–	—	—
Do. do. 2nd Pref.	5	6	—	15/–	—	—
Do. do. 5% Deb.	Stock	5	5	22½	—3	—
British Electric Traction Def. Ord.	,,	5	5	875	—	—
Do. do. Pref. Ord.	,,	8	8	117	—	6 16 9
Brazil Traction	100	8	—	15	—1½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	90½	—	5 10 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	9/3	—	—
London United Tram Deb.	Stock	4	4	57½	—	6 19 2
Mexico Trams, 5% Bonds	—	5	5	27½	—	18 3 8
Mexican Light Common	100	Nil	Nil	25	—	—
Do. 7% Pref.	100	7	7	35	—	20 0 0
Do. 1st Bonds	—	5	5	62	+7	8 1 4
Victoria Falls Ord.	1	15	15	58/9	—	5 2 2
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—
MANUFACTURING COMPANIES						
Assoc. Elec. Ord.	1	6	6	23/9	—	5 1 1
Do. Pref.	1	8	8	27/6	—	5 16 5
Babcock & Wilcox	1	15	14	52/6	—	*5 8
British Aluminium Ord.	1	10	10	31/3	—	6 8 0
British Insulated Ord.	1	15	15	3	—¼	5 0 0
Brush Ord.	Stock	10	5	75	—	6 13 4
Callender's	1	15	15	2½	—	5 2 2
Do. 6½% Pref.	1	6½	6½	23/9	+¼	5 9 5
Crompton Parkinson Ord.	5/–	30	30	22/6	—	6 13 4
Do. 8% Pref.	1	8	8	28/3	—	5 13 3
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	91½	—	5 9 3
Electric Construction	1	5	Nil	12/6	—	—
Enfield Cable Ord.	1	25	25	4½	—	5 17 8
English Electric	1	Nil	Nil	10/–	—¼	—
Do. do. Pref.	1	Nil	Nil	8/9	—	—
Ferranti Pref.	1	7	7	21/3	—	6 11 9
G.E.C. Pref.	1	6½	6½	24 6	+6d.	5 6 1
Do. Ord.	1	14	10	46/3	—¼	4 4 3
Henley's	1	30	30	5½xd	—¼	5 5 5
Do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	6/9	+6d.	—
Johnson & Phillips	1	10	10	28/9	—	6 19 2
Siemens Ord.	1	7½	7½	23/3xd	—	6 9 0
Telegraph Construction	12	10	7½	13	—	6 18 6

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1929

31,930. "Electromagnetic switches." Allen West & Co., Ltd., and V. Breeze. July 21st, 1930. (359,420.)

1930

7,061. "Systems of electric remote control or supervision." General Electric Co., Ltd., and N. C. Smart. December 3rd, 1930. (359,576.)

12,557. "Sound amplifiers for gramophones, wireless loud-speakers, telephones, and the like." C. O. Paton-Moore and C. A. Keays. December 30th, 1930. (359,577.)

12,695. "Means for protecting the windings of dynamo-electric machines." International General Electric Co., Inc. April 24th, 1929. (359,506.)

15,144. "Electric pumps." Tecalemit, Ltd. February 10th, 1930. (Addition to 350,667.) (359,443.)

15,252. "Electric regeneration equipment for tramways." Compagnie Générale Française de Tramways. June 5th, 1929. (359,444.)

15,746. "Signals for controlling street traffic." J. A. Harriss. April 8th, 1930. (359,445.)

18,655. "Call metering in telephone systems." Telefon aktiebolaget L.M. Ericsson. June 21st, 1929. (359,448.)

19,985. "Electric temperature-measuring instruments." Cambridge Instrument Co., Ltd., J. L. Orchard, and C. D. Sutton. March 25th, 1931. (359,380.)

20,973. "Automatic high-speed multiplex telegraph systems." Soc. Française Radio-Electrique. July 10th, 1929. (359,518.)

21,384. "Electric driving systems employing a plurality of motors." Akt.-Ges. Brown, Boveri et Cie. July 22nd, 1929. (359,451.)

21,519. "Quick make-and-break electric switches." T.S. Motors, Ltd., and E. H. Dine. July 16th, 1930. (359,431.)

21,618. "Totalisator apparatus and electrical circuits therefor." A. Watts. July 17th, 1930. (359,410.)

21,696. "Electromagnetic apparatus for detecting faults in rails." S. Sakurai, M. Suzuki, and H. Chiba. July 23rd, 1929. (359,432.)

21,836. "Diaphragm for recording and reproducing acoustic oscillations." Allgemeine Elektricitats-Ges. July 18th, 1929. (359,526.)

21,913. "Arrangement for blocking parts of the line of a remote-control installation against control currents." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). July 19th, 1930. (359,460.)

21,945. "Electrically heated devices for controlling temperature." R. H. Whillock and Griffin & Tatlock, Ltd. July 21st, 1930. (359,529.)

22,012. "Electric batteries." J. W. Manley. July 21st, 1930. (Patent of addition not granted.) (359,441.)

22,065. "Simplified device for electrically recording gramophone records." A. E. Bawtree. July 22nd, 1930. (359,532.)

22,116. "Process for the manufacture of fabric for electric insulating bands." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). July 22nd, 1930. (359,533.)

22,236. "Train-control systems." Associated Telephone and Telegraph Co. September 23rd, 1929. (359,499.)

22,247. "Radio-receiving systems." Kolster-Brandes, Ltd. (Kolster Radio Corp.). July 23rd, 1930. (359,500.)

22,318. "Rotary step-by-step switches for use in telephone or like systems." Standard Telephones & Cables, Ltd., K. M. Sana, and G. Chevigny. July 24th, 1930. (359,537.)

22,320. "Telegraph switching systems." A. F. Connery and International Communications Laboratories, Inc. July 24th, 1930. (359,538.)

22,322. "Synchroniser for rotary devices." A. F. Connery and International Communications Laboratories, Inc. July 24th, 1930. (359,540.)

22,324. "Control of automatic selector switches for telephone or other remotely controlled systems." Standard Telephones and Cables, Ltd. (W. Hatton). July 24th, 1930. (359,542.)

22,325. "Device for checking phase in phototelegraphic apparatus." Standard Telephones & Cables, Ltd. August 15th, 1929. (359,543.)

22,370. "Electric motor control systems." F. Whyman and Associated Electrical Industries, Ltd. July 24th, 1930. (359,548.)

22,410. "Variable electrical condensers." Standard Telephones & Cables, Ltd., and P. R. Painton. July 25th, 1930. (359,551.)

22,473. "Train-control systems." Associated Telephone and Telegraph Co. September 25th, 1929. (359,558.)

22,533. "Direction-finding apparatus." Marconi's Wireless Telegraph Co., Ltd., and T. L. Eckersley. July 25th, 1930. (Addition to 14,080/30.) (359,562.)

22,584. "Submarine electric signalling cables." Electrical Research Products, Inc. September 13th, 1929. (359,564.)

22,602. "Piezo-electric devices." L. A. Levy, D. W. West, and J. Robinson. July 26th, 1930. (359,567.)

22,621. "Electrical battery connections." H. W. Massey. July 26th, 1930. (359,569.)

22,833. "Mercury-vapour rectifiers." British Thomson-Houston Co., Ltd. (General Electric Co.). July 29th, 1930. (359,587.)

22,856. "Luminous electric discharge tubes." General Electric Co., Ltd. September 4th, 1929. (359,588.)

22,884. "Ignition dynamo-electric generating machines and magnetos." F. R. Simms and Simms Motor Units, Ltd. July 29th, 1930. (359,592.)

22,956. "Electric testing-devices." J. H. Runbaken. July 30th, 1930. (359,593.)

23,055. "Impulsing arrangements for automatic telephone systems." Siemens Bros. & Co., Ltd., and D. A. Christian. July 31st, 1930. (359,596.)

23,071. "Electrically heated domestic apparatus." A. Imbery. July 31st, 1930. (359,598.)

24,471. "Electric plug connectors." W. W. Triggs (Belden Manufacturing Co.). August 15th, 1930. (359,615.)

25,378. "Volume-control means for electric sound-reproducing or sound-recording circuits." W. A. J. Thorn. August 25th, 1930. (359,625.)

26,025. "Electrical control protective or measuring systems." Westinghouse Electric & Manufacturing Co. August 30th, 1929. (359,633.)

26,095. "Electric motor control apparatus, more particularly intended for application to electric steering-gear for ships." W. H. Scott. September 1st, 1930. (359,635.)

26,659. "Construction of scanning-apparatus for use in television systems and the like." T. W. Collier, D. H. Byron, B. W. K. Goode, and Baird Television, Ltd. September 6th, 1930. (359,639.)

27,657. "Modulated carrier transmitters." Telefunken Ges. für Drahtlose Telegraphie. October 9th, 1929. (359,650.)

28,295. "Wireless receiving circuits." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Oct. 3rd, 1929. (359,660.)

28,950. "Electric heating apparatus." F. W. Richardson and H. C. Richardson (trading as Vulcan Electric Heaters). Sept. 27th, 1930. (359,667.)

28,951. "Quick-action rotary electrical switches." Santon, Ltd., and H. C. Sanders. Sept. 27th, 1930. (359,668.)

29,295. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. Sept. 30th, 1930. (359,671.)

29,868. "Primary electric cells and batteries." A. P. Welch. Oct. 6th, 1930. (359,676.)

30,850. "Radio receiving circuit." Kolster-Brandes, Ltd. Oct. 15th, 1929. (359,698.)

31,424. "Systems of electrical distribution." British Thomson-Houston Co., Ltd. Oct. 19th, 1929. (359,707.)

31,876. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Nov. 23rd, 1929. (359,712.)

31,885. "High-tension electrical machine." Siemens-Schuckertwerke Akt-Ges. Feb. 28th, 1930. (359,713.)

32,125. "Switch fuses for overhead transmission lines and the like." English Electric Co., Ltd., A. M. Pooley, and A. A. Heath. Oct. 25th, 1930. (359,718.)

32,404. "Device for preventing damage to commutators or slip-rings of dynamo-electric machines due to excessive wear of the brushes." J. W. Mellwig and H. Riese. Oct. 28th, 1929. (359,724.)

32,795. "Electric cigar-lighters." H. Bach. Nov. 4th, 1929. (359,734.)

33,584. "Change-speed mechanism for electrically driven ring spinning and doubling frames." Maschinenfabrik Oerlikon. Nov. 8th, 1929. (359,746.)

33,797. "Gasfilled electric lamps." Vereinigte Gluhlampen und Elektricitats Akt-Ges. Aug. 8th, 1930. (359,749.)

34,453. "Means for driving a plurality of mechanically co-operating electric motors." Allmanna Svenska Elecktriska Aktiebolaget. Nov. 26th, 1929. (359,754.)

34,992. "Heterodyne receiving systems." Marconi's Wireless Telegraph Co., Ltd. Nov. 20th, 1929. (359,760.)

34,993. "Power-supply circuits suitable for use in connection with radio and like receivers." Marconi's Wireless Telegraph Co., Ltd. Nov. 20th, 1929. (359,761.)

35,460. "Electric incandescent lamps." Elektrische Gluhlampenfabriek Watt Akt.-Ges. Feb. 19th, 1930. (359,766.)

36,222. "Reflectors for electric lighting fittings." W. B. Topp. Jan. 24th, 1930. (359,777.)

36,997. "High-frequency receivers." Telefunken Ges für Drahtlose Telegraphie and W. Ludenia. Dec. 10th, 1929. (359,785.)

37,290. "Electric motors." British Thomson-Houston Co., Ltd. Dec. 12th, 1929. (359,787.)

37,330. "Apparatus for eliminating disturbing oscillations in wireless receiving and transmitting apparatus." W. G. Gold and W. Bayliss, Ltd. Dec. 11th, 1930. (359,788.)

37,575. "Telephone systems employing selectors." Siemens & Halske, Akt.-Ges. Dec. 12th, 1929. (359,794.)

1931.

296. "Multiplex telegraph systems." Telefunken Ges für Drahtlose Telegraphie. Jan. 3rd, 1930. (359,812.)

2,089. "Electrically actuated apparatus indicating signs at a distance." H. Ickler. Jan. 22nd, 1930. (359,824.)

2,871. "Starters for electric motors." W. G. Gold and W. Bayliss, Ltd. Jan. 29th, 1931. (359,827.)

5,147. "Electric mercury or other conducting liquid switches." British Thomson Houston Co., Ltd. Feb. 20th, 1930. (359,842.)

6,242. "Manufacture of electric incandescent lamps thermionic valves, or the like." General Electric Co., Ltd. March 25th, 1930. (Addition to 293,313.) (359,848.)

6,322. "Connecting devices for the cables of screened electrical-ignition apparatus." Fabrica Italiana Magneti. Marelli. March 1st, 1930. (359, 849.)

12,206. "Electric lamps." General Electric Co., Ltd. June 28th, 1930. (359,875.)

13,401. "Polyphase thermionic generators." British Thomson-Houston Co., Ltd. May 20th, 1930. (359,876.)

16,482. "Electric motor control systems." International General Electric Co., Inc. June 6th, 1930. (359,880.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 11th:—

Insulex. No. 524,276. Class 5. Wire.—Frederick L. Lesingham, 13, Victoria Street, Westminster, S.W.1.

KolStar (lettering and design). No. 525,618. Class 8. Radio receiving and transmitting sets, gramophones used in combination with radio receiving sets, and parts thereof.—Kolster Brandes, Ltd., Cray Works, Sidcup, Kent.

Hardale. No. 526,207. Class 8. Electric batteries (not for medical purposes), radio receiving sets and parts thereof.—Hardman & Co., Ltd., The Baum, Yorkshire Street, Rochdale.

Millgate. No. 526,250. Class 8. Wireless telegraphic and telephonic apparatus and parts thereof.—Chorlton Metal Co., Ltd., Millgate House, Blossom Street, Manchester.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashby-de-la-Zouch. — Wesleyan church, Moira (£2,700); trustees.

Barrow-upon-Soar.—Houses (24), Rothley, for the R.D.C.; E. T. Allcock, 11, Leicester Road, Loughborough.

Bath.—Extensions, including arcade, for Hooper & Dark, Ltd., Southgate Street and Dorchester Street.

Bedlington (NORTHUMBERLAND).—Houses (50) for the U.D.C.; J. W. Pooley, surveyor, Council Offices. Reconstruction of the C. of E. school; C. F. Murphy, architect, Lloyds Bank Chambers, Morpeth.

Beverley (YORKS).—Additions to the County Hall for the East Riding C.C.; B. Stamford, county architect, County Hall.

Bilston (STAFFS).—Shop premises, Church Street, for Amies & Clark; Perks & Gould, builders.

Birmingham.—Houses (1,100), Weoley Castle estate; H. Boot & Sons, Ltd. Shops at the corner of Solihull Lane and Stratford Road, Hall Green; Harford, Kingham & Neck, architects, 117, Colmore Road. Extensions to Handsworth Wesleyan College (£33,000); trustees.

Blackburn.—St. Gabriel's Church, Brownhill (£16,000); vicar.

Blaydon (DURHAM).—Clinic (£2,500); county architect.

Bolton.—Elementary school (400 places) for the Catholic Authorities; J. Baxendale, architect, 33, Penarth Road.

Bournemouth.—Development of Pine Grange estate, Bath Road; Seal & Hardy. Extensions to Corpus Christi Church, Christchurch Road; Rev. R. Baines.

Brampton.—Sewage disposal scheme for the R.D.C.; G. A. Gray, surveyor, Main Street.

Brierley Hill (STAFFS).—Houses (100), Hawbush estate, for the U.D.C.; Barker & Sons, builders, Loughborough.

Brighton.—Alterations and additions, 20-3, Middle Street and 66-8, West Street; B. D. Pinfold.

Burbage (LEICESTER).—Factory for Harding & Co., Hinckley Road; R. H. Simmonds, builders, Hawley Road, Hinckley.

Burslem (STAFFS).—Alterations, Longport Mills; H. & R. Johnson, Ltd.

Coventry.—Church; Austin & Paley, architects, Castle Park, Lancaster.

Darlaston (STAFFS).—Works extensions (£10,000), for C. Richards & Sons, Ltd., Richards Street.

Darlington.—Workshops, near Bank Top station, for the L.N.E.R.; T. H. Bygate, district engineer.

Derby.—Waterworks workshops, etc. (£7,000), for the T.C.; borough architect.

Derbyshire.—School, Chaddesden, for the county E.C.; G. H. Widdows, county architect, St. Mary's Gate, Derby.

Dorchester.—Houses (20), Victoria Park, for the T.C.; H. D. Strange, borough surveyor.

Durham.—Extension of Seaham Hall Sanatorium for the C.C. (£30,000). Schools, Billingham (£6,000) and Horden, for the E.C.; director of education.

Ealing.—Shops (9) with flats, Ruislip Road; W. Hurst. Houses (99), Berkeley Avenue; R. Costain & Sons, Ltd. Shops, store and flats at 15, Uxbridge Road, for F. W. Woolworth, Ltd.; also cinema, Uxbridge Road; North, Robin & Wilsdon, architects, Greycoat Place, S.W.1. Stores, etc., for A.R.P. Studios; R. Atkinson, architect, 12, Wigmore Street, W.1. Flats (2 blocks) at Park Hill and King's Road, for R. Sowery; W. H. Read & Co., Ltd., architects, 42, Haven Green, W.5. Extensions for Sanders, Ltd., the Broadway; A. & B. Hanson, Ltd., contractors, Southall.

East Ham.—Alterations and improvements to St. Edmund's Church, Katherine Road; P. C. Boddy, architect, 27, Catherine Street, London, S.W.1.

East Sussex.—Extensions, Darvell Hall Sanatorium, Robertsbridge (£34,075), for the C.C.; county architect, Lewes.

Edinburgh.—School, Niddrie; executive officer to the Education Authority.

Epping (ESSEX).—Houses (30) for the U.D.C.; H. C. Burton, builder.

Eston (YORKS).—Development of Normanby estate; H. Fulton.

Fifeshire.—Houses (180) for the Leven T.C.; burgh surveyor.

Gillingham (KENT).—Houses, Chada Avenue; C. J. Varrall, builders, Chada House, Sturdee Avenue. Alterations to premises, Nelson Road, for the Maidstone and District Motor Services, Ltd.; F. W. Ruck & Smith, architects, 86, Week Street, Maidstone. Premises, Oxford Road; A. H. Horne, builder, Clen Century Road, Rainham.

Glasgow.—Houses (24), Altyre Road; housing director.

Great Yarmouth.—Block of business stores, King Street; R. H. Carter & Son, builders, Southtown.

Hailsham (SUSSEX).—Houses (28), South Road, for Bolney Wood Estate Co.; secretary.

Halesowen (WORCS).—Council chamber and library for the U.D.C.; surveyor.

Halifax.—Omnibus depôt, Elmwood; P. Saunders, town clerk, Town Hall.

Hamilton.—Law court and offices (£67,500); C.C. architect.

Hanley.—Reconstruction of premises, Grosvenor Street; R. H. Bell, Ltd.

Hitchin.—Houses and flats (166), Walsworth estate; U.D.C. surveyor.

Huddersfield.—Re-erection of woollen spinning mill, Crosland Moors, for Ramsdens Bros., Ltd.

Hull.—Schools, Endyke Lane (£30,000); director of education, Education Offices, Guildhall.

Irish Free State.—(CLIFDEN, Co. GALWAY).—District Hospital for Galway Board of Health; F. Gibney, architect, 16, Westmorland Street, Dublin. (LIMERICK).—Electric wiring installation, St. Mary's Church; MacEntee & O'Kelly, consulting engineers, 9, Dawson Street, Dublin. (NEWRY, Co. DOWN).—Schools, Croneagh and Rochvale, for the County E.C.; C. J. Love, architect, 5, Wellington Place, Belfast.

Lancaster.—Hall, etc., Scotforth Road, for Scotforth Labour League; T. Johnson, builder, Ulster Road.

Leamington.—Alterations to Colonnade Theatre; licensee.

London.—(BETHNAL GREEN).—Buildings, 260, Cambridge Road, for C. A. Wells; Andrews & Peascod. (CAMDEN TOWN).—Buildings, King's Road and College Grove, for W. & M. Hyman; A. Mather. (DEPTFORD).—Alterations, L.C.C. pumping station (£13,345); D. G. Somerville & Co., Ltd. (ST. MARYLEBONE).—Nursing home (£1,000,000), Marylebone Road; Medical Treatment and Nursing Home Syndicate. (ST. PANCRAS).—Reconstruction scheme, Drummond Crescent area; St. Pancras House Improvement Society, Ltd. (WESTMINSTER).—Buildings for the Victoria Embankment Properties, Ltd., Water Street; Grave and Farmer.

Maidstone (KENT).—Remodelling of Coxheath Institution (£25,000); county architect.

Manchester.—Wesleyan church, Maitland Avenue, Barlow Moor (£6,500); trustees. Garage, Sale Road and Button Lane, Northenden, for H. Parish; Roberts & Wood, architects, 26, King Street.

Nantwich (CHESHIRE).—Factory extensions, Millstone Lane, for Messrs. Dewhurst; S. Davies, builder.

Newcastle-on-Tyne.—Factory in the Bigg Market for Sinton and Baxter; M. K. Glass, architect, 20, Saville Row. Reconstruction of the Lord Whorncliffe Hotel; Hetherington and Wilson, architects, 52, Westgate Road. Alterations to bank, Scotswood Road; architect's department, Lloyds Bank Ltd.

Northumberland.—Additions to Seaton Delaval Astley Central School (£8,900), for the C.C.; W. W. Tasker, county architect, 17, Claremount Place, Newcastle-on-Tyne.

Oldham.—Dairy for the Oldham Industrial Co-operative Society, Ltd., Foundry Street (£17,000); J. Hartley, builders, Cobden Street, Chadderton. Re-erection of Woodend Mill, Springhead, for Dunkerley Bros. (£50,000).

Oxford.—Houses (38), Glebe estate (£16,536); A. Drew, Cheltenham.

Paignton.—Development of Colley End Road estate; Eastley and Co. Additions, 24, Garfield Road; Dellers Supply Stores, Ltd.

Paisley.—Infectious diseases hospital; burgh surveyor.

Port Talbot (GLAMORGANSHIRE).—Municipal housing scheme, Sandfields; borough surveyor.

Queensbury (YORKS).—Houses (40), Stones Lane, for W. Middleton, Thackley.

Reigate.—Enlargement of Poor Law Institution; Saxon, Snell and Phillips, architects.

Richmond (YORKS).—Alterations to café and shops, High Row, for Mr. Jackson; Wetherell & Dent, architects, High Row Chambers.

Rottingdean (SUSSEX).—Alterations and additions to Continental Hotel, High Street; M. Wilshire.

St. Helens (LANCS).—Extensions, Sutton Manor schools, for the borough E.C.; C. J. Middlehurst, builder.

Salford.—Rebuilding works of W. W. Hill, Son & Wallace, Elton Street, Lower Broughton; Bain & Johnson, architects, 38, Albion Street, Leeds.

Sedgfield.—Offices for the Guardians (£4,336); Harland and Parker, West Hartlepool.

Shoreham (SUSSEX).—Re-erection of Arthur's Beach Club (£7,000); A. Godfrey, managing director.

Silchester (READING).—Re-erection of sawmills for G. Ford and Sons; Mortimer West.

Southampton.—Civic centre buildings; quantity surveyor, 42, Gordon Square, London, W.C.1.

Southmoor (DURHAM).—R.C. church; F. Coyle, architect, Newmarket Street, Consett.

South Shields.—Houses, Cleadon Park, and Mitre Street area (300); borough engineer. Alterations to premises, Winchester Street; T. A. Page & Son, architects.

Stafford.—Wesleyan chapel (£1,700), Barlaston; trustees. Extensions, St. Joseph's Convent (£22,000); G. Sandy & Co., builders.

Staffordshire.—Senior school, Coseley (£37,125), for the E.C.; A. H. Guest, Ltd., builders, Stourbridge. Extension of school, Huntington, Hednesford; director of education, County Education Offices, Stafford.

Stourbridge.—Residences, Meredin Avenue; E. D. R. Tooby, builder, Cathcart Road.

Stratford-on-Avon.—Houses (115); R.D.C. surveyor.

Surrey.—School, Caterham, for the county E.C.; W. W. Finny, secretary, Kingston-on-Thames. School, Coulsdon, for the county E.C. (£41,444); E. H. Denne & Son, contractors. School clinic, Middleton Road, Morden; county architect, Kingston. School, Sutton and Cheam, for the county E.C. (£20,839); J. Bodle, Ltd., contractors.

Thornaby (DURHAM).—Houses (101) on the Thornaby Grange site, for the T.C.; borough engineer.

Wakefield.—Houses (88), Darnley estate; G. Crook & Sons, Ltd.

West Riding.—Senior school and caretaker's house, Whitwood, for the C.C.; R. K. Poskin, builder, Knottingley, Yorkshire.

Weymouth.—Houses (20), Wyke Regis, for the R.D.C.; F. Box, builder, Bournemouth.

Wigan.—Alterations and additions, Victoria House, Market Place, for J. Lowe, Ltd.; J. Walkden, Ltd., builders, Monument Lodge.

Winchester.—Houses (134), Highcliffe Park Estate, for the T.C.; city engineer.

Wyken (WARWICK).—Junior school (£12,151); Bosworth & Wakeford, Ltd.